

UTAH COMBINED

HYDROCARBON



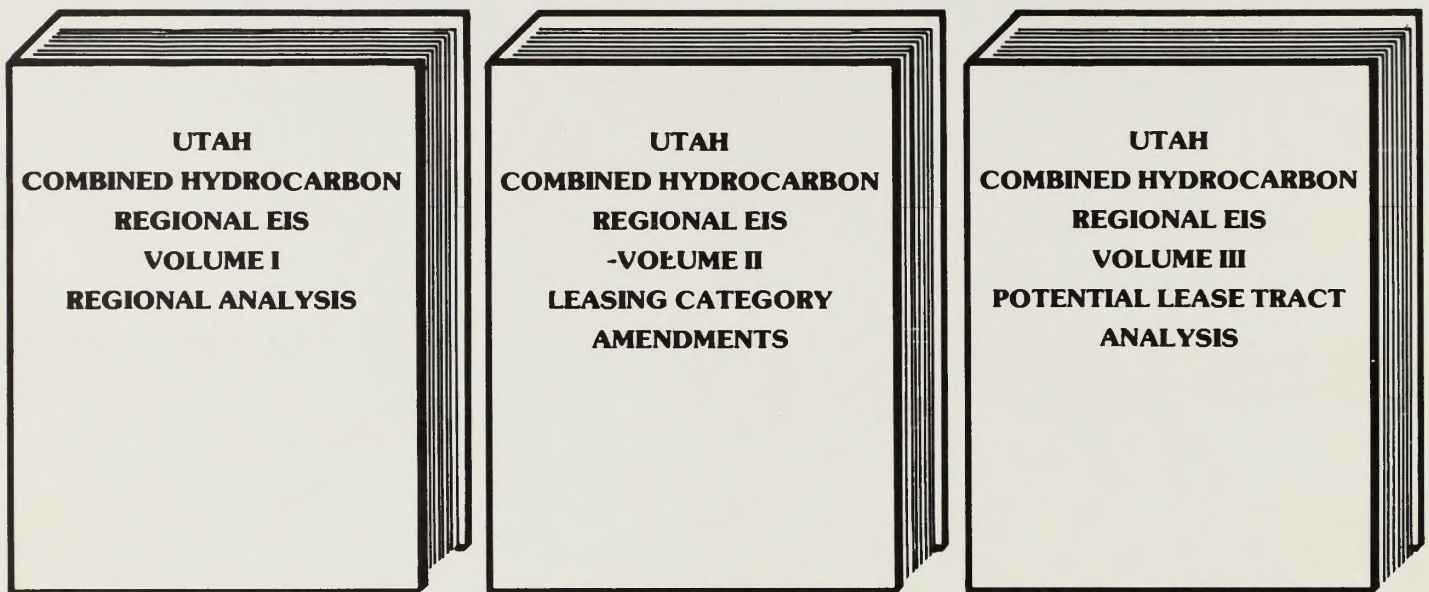
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REGIONAL

DRAFT EIS



VOLUME II: LEASING CATEGORY AMENDMENTS



Why Is This Environmental Impact Statement Divided into Three Volumes?

This EIS is divided for ease of handling the volume of data involved and to clearly separate three levels of analyses. Each volume addresses a separate proposal and analyses, along with specific major Federal actions, required to implement the Combined Hydrocarbon Leasing Program in Utah.

What Does Each Volume of This EIS Contain?

Volume I contains the regional assessment for implementation of the Bureau of Land Management's Combined Hydrocarbon Leasing Program for Utah. This analysis examines high and low production levels and no action at various periods of time during a 20-year time frame. This volume serves as the regional assessment for all required site-specific Combined Hydrocarbon Lease EISs in Utah.

Volume II contains proposed planning amendments to update BLM's land use plans. These updates propose categories for issuing new leases or converting existing oil and gas leases to Combined Hydrocarbon Leases.

Volume III contains the site-specific assessment for issuing Combined Hydrocarbon Leases on potential lease tracts within Special Tar Sand Areas.

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UTAH COMBINED HYDROCARBON LEASING

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VOLUME II

LEASING CATEGORY AMENDMENTS

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Prepared By:
DEPARTMENT OF THE INTERIOR
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Utah State Office**

Counties That Could Be Directly Affected: Carbon, Duchesne, Emery, Garfield, Grand, San Juan, Uintah, and Wayne, all in the State of Utah.

ABSTRACT: The Bureau of Land Management proposes to amend leasing categories in land use plans in Moab, Cedar City, and Vernal Districts. These amendments are required to update present categories which consider only oil and gas development. New categories will consider development of all hydrocarbon resources (oil and gas and tar sand). Following completion of the Final EIS, decisions will be made on category designations; these will become part of the affected land use plans. This volume of the environment impact statement proposes several different category combinations for seven of the 11 Special Tar Sand Areas within Utah. Analysis is on a site-specific level and considers environmental impacts resulting from development and no development of hydrocarbon resources.

For Further Information, Contact: Alan Partridge, EIS Team Leader, Richfield District Office, Bureau of Land Management, 150 East 900 North, Richfield, Utah 84701, or call (801) 896-8221.

Comments of the Draft EIS must be received by January 14, 1984

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REGIONAL EIS

VOLUME II

LEASING CATEGORY AMENDMENTS

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
NATURAL RESOURCES

David L. [illegible]

1. The purpose of this document is to provide information regarding the proposed amendments to the Leasing Category for the Utah Combined Hydrocarbon Leasing. The amendments are intended to clarify the requirements for the leasing process and to ensure that the process is consistent with the National Environmental Policy Act (NEPA) and the Federal Land Management Policy Act (FLMPA).

2. The amendments are as follows:

- a. The definition of "Leasing Category" shall be amended to include the following: "Leasing Category is a classification of land that is used to determine the requirements for the leasing process." b. The definition of "Leasing Category" shall be amended to include the following: "Leasing Category is a classification of land that is used to determine the requirements for the leasing process." c. The definition of "Leasing Category" shall be amended to include the following: "Leasing Category is a classification of land that is used to determine the requirements for the leasing process."

3. The amendments are intended to clarify the requirements for the leasing process and to ensure that the process is consistent with the National Environmental Policy Act (NEPA) and the Federal Land Management Policy Act (FLMPA).

4. The amendments are intended to clarify the requirements for the leasing process and to ensure that the process is consistent with the National Environmental Policy Act (NEPA) and the Federal Land Management Policy Act (FLMPA).

5. The amendments are intended to clarify the requirements for the leasing process and to ensure that the process is consistent with the National Environmental Policy Act (NEPA) and the Federal Land Management Policy Act (FLMPA).

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LIST OF AGENCIES AND ORGANIZATIONS REQUESTED TO COMMENT ON THE DRAFT EIS

BLM is requesting comments on this Draft EIS from the agencies and organizations listed below. Comments from companies who expressed interest in leasing or applied for lease conversions are requested. All other interested and/or affected individuals, private groups, and agencies are also invited to comment.

Federal Agencies

Army Corps of Engineers
Environmental Protection Agency
Federal Energy Regulatory Commission
U.S. Department of Agriculture
Forest Service
Soil Conservation Service
U.S. Department of the Interior
Bureau of Indian Affairs
Bureau of Mines
Bureau of Reclamation
Fish and Wildlife Service
Geological Survey
National Park Service
Office of Surface Mining

Utah State Agencies

Clearinghouse
Department of Community and Economic Development
Department of Transportation
Department of Natural Resources and Energy
Division of Lands
Division of Oil, Gas, and Mining
Division of State History
Division of Water Resources
Division of Wildlife Resources
Geological and Mineral Survey
Office of the State Planning Coordinator

Local Government Agencies

Carbon County Commission
Duchesne County Commissioners
Garfield County Commission
Roosevelt Chamber of Commerce
Six County Economic Development District
Six County Organization of Governments
Southeastern Association of Governments
Uinta Basin Association of Governments
Uintah County Commissioners
Wayne County Commission

Nongovernment Agencies

American Fisheries Society
Archaeological Society of Utah
Council on Utah Resources
Defenders of the Outdoor Heritage
Friends of the Earth

ISSUE

National Parks and Conservation Association
National Woolgrowers Association
Natural Resources Defense Council
Rocky Mountain Oil and Gas Association
Sierra Club

SOURCE

Utah Audubon Society
Utah Cattlemen's Association
Utah Geological Association
Utah Mining Association
Utah Nature Study Association
Utah Water Resources Council
Utah Wildlife Federation
Ute Indian Tribe
Wild and Scenic Rivers
Wilderness Society
WHOA!

EIS Availability

Copies of this Draft EIS will be available for public inspection at the BLM offices listed below:

Washington Office of Public Affairs

18th and C Street, N.W.
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Salt Lake City, Utah 84111
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Moab District Office

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Moab, Utah 84532
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Cedar City District Office

1579 North Main
Cedar City, Utah 84720
Phone: (801) 586-2401

Vernal District Office

170 South 500 East
Vernal, Utah 84078
Phone: (801) 789-1362

Copies of this Draft EIS may also be requested from the Utah State Office and the Richfield District Office at the above-listed addresses.

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STSA DESCRIPTIONS

The seven study districts are: San Rafael, Argyle Canyon, Willow Creek, Sunnyside, and two others. Each district is described in terms of its location, size, and other characteristics.

San Rafael River STSA

MAJOR ISSUES

The San Rafael River STSA is a river valley with a wide flood plain. The river is a major source of water for irrigation and domestic use. The flood plain is a major source of sediment and silt. The river is a major source of water for irrigation and domestic use. The flood plain is a major source of sediment and silt.

EXISTING ENVIRONMENT

The STSA is located in central Santa Clara County. It is a river valley with a wide flood plain. The river is a major source of water for irrigation and domestic use. The flood plain is a major source of sediment and silt. The river is a major source of water for irrigation and domestic use. The flood plain is a major source of sediment and silt.

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The San Rafael River contains outstanding trout and salmon populations. The river is a major source of water for irrigation and domestic use. The flood plain is a major source of sediment and silt.

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ALTERNATIVE DESCRIPTIONS

Each of the seven study districts is described in terms of its location, size, and other characteristics. The descriptions are based on a review of the literature and field observations.

SUMMARY

INTRODUCTION

This Draft Environmental Impact Statement (EIS) addresses future management options for leasing oil and gas and tar sand resources on Bureau of Land Management (BLM) public lands throughout the State of Utah. In 1975, each BLM District in Utah assessed oil and gas development potential and environmental impacts resulting from oil and gas within their respective management areas. At that time, all public lands were placed in categories. However, in 1981 the Combined Hydrocarbon Leasing Act amended the Mineral Lands Leasing Act of 1920 to allow for development of all hydrocarbon resources (oil and gas and tar sand). Therefore, those areas known to contain tar sand resources (Special Tar Sand Areas (STSAs)) must be reanalyzed and revised category designations established which consider impacts resulting from tar sand recovery methods.

The Combined Hydrocarbon Act of 1981 not only established a competitive program for sale of new hydrocarbon leases, it also allowed holders of Federal oil and gas leases issued on or before November 16, 1981 to convert to combined hydrocarbon leases (CHLs), if their leases occurred within STSAs. Proposed alternatives for category amendments in this EIS will consider the following: (1) which unleased areas to offer for new hydrocarbon lease sales; (2) which existing oil and gas leases to convert to CHLs; and (3) conditions, categories, and stipulations for CHLs.

This volume of the EIS contains proposals for amending leasing categories for seven of the 11 STSAs in Utah. Land use plans for three BLM Districts (Moab, Cedar City, and Vernal) require recategorization. Included in this volume are (1) an explanation of purpose and need for this EIS; (2) a description of the planning process; and (3) site-specific data for each STSA, including descriptions of the existing environment, proposed alternatives for recategorization, and anticipated environmental consequences resulting from recategorization.

Public scoping for category amendments has occurred throughout the planning process. The public, affected Federal, State, and local government agencies, oil and gas companies, and other private businesses were involved in initial issue identification. Comments received at that time have been used to define the level of detail for resource analysis in this EIS. Comments also affected proposed leasing category amendments proposed. Following publication of this EIS, a 60-day comment period will be provided. Final decisions for category amendments will be made after the 30-day public comment period following publication of the Final EIS. At that time, land use plans will be amended to reflect the new leasing categories.

ALTERNATIVE DESCRIPTIONS

Generally, the following four alternatives were considered in development of leasing category amendments for each STSA: (1) maximum development; (2) no action; (3) multiple use (preferred alternative); and (4) restricted development. Analysis for recategorization included a review of the existing oil and gas leasing categories and an

evaluation of additional impacts resulting from tar sand development. Both surface mining and in-situ methods for tar sand extraction were considered. Impacts to the human environment, sensitive resource values, and those resources protected by law were also considered when developing category amendments and alternatives. Where necessary, special stipulations were developed to protect sensitive resources.

STSA DESCRIPTIONS

This section briefly describes, by STSA, major issues, existing environment, and environmental consequences resulting from implementation of each alternative.

San Rafael Swell STSA

MAJOR ISSUES

Major issues related to tar sand development within the STSA include: (1) conflicts with outstanding recreation uses and scenic opportunities; (2) protection of sensitive watersheds and erosion control; (3) protection of wilderness values; (4) loss of uranium and vanadium resources overlaying tar sand deposits; and (5) loss of wildlife habitat, grazing use, and vegetation.

EXISTING ENVIRONMENT

This STSA is located in central Emery County. BLM administers the tar sand and surface estates on 115,233 acres (88 percent of this STSA). Air quality is classified as Class II, which allows for moderate increases in air pollution levels; climate is semi-arid to arid. The eastern portion of the STSA is located in the San Rafael Swell, while the western portion consists of Sinbad country. Tar sand mainly occurs in the Black Dragon member of the Moenkopi formation, and content ranges from 2 to 17 percent. Uranium and copper deposits in the STSA are small; however, some uranium mines have had substantial production. Manganese and bedded potash deposits in the STSA are presently not considered feasible for development.

Soils within the STSA are highly susceptible to erosion once vegetation is removed. Vegetation consists of three general types: pinyon-juniper, grassland-desert shrub, and riparian. Tributaries to Muddy Creek drain through the southern portion, while the San Rafael River crosses the northern end of the STSA. Several small springs, ponds, reservoirs, and wells also occur in the STSA. Principal wildlife concerns are desert bighorn sheep and golden eagles. Riparian areas provide high value wildlife habitat (e.g., passerine birds, etc.). The San Rafael River area is also historic habitat for the endangered peregrine falcon. A small population of wild burros inhabit the STSA. No agricultural lands occur within the STSA; however, 15 grazing allotments provide forage for cattle, sheep, and a few saddle horses.

The San Rafael Swell contains outstanding visual qualities. Scenic overlooks occur in the vicinity of Mexican Mountain, Sid's Mountain, and Devil's Canyon. Both pre-

SUMMARY

historic and historic sites also occur within the San Rafael Swell. Recreation activities include rafting, canoeing, tubing, and hiking on the San Rafael River. The area also provides opportunities for scenic sightseeing, camping, picnicking, and off-road vehicle (ORV) uses.

ENVIRONMENTAL CONSEQUENCES

Under Alternative 1, Maximum Development, tar sand development could occur on 115,705 acres, producing approximately 500 million barrels of bitumen. Air quality could be degraded throughout the STSA; also, alteration of topographic features, increased soil erosion, vegetation disturbance, and water resource degradation could occur. Development would impact wildlife species, including desert bighorn sheep, wild horses and burros, and golden eagles. Additionally, animal unit months (AUMs), scenic quality, archaeological, and recreational values could be lost. Housing shortages and overburdening of public facilities could occur, although employment and revenue would increase.

Alternative 2, No Action, would allow tar sand development on 76,828 acres, producing 245 million barrels of bitumen. Air quality could be degraded significantly, although the extent would not be as great as under Alternative 1. Topographic features could be altered and soil erosion, vegetation disturbance, and water resource degradation could increase. Wild horses, burros, golden eagles, and other wildlife species could be impacted, and grazing AUMs could be lost. Additionally, scenic quality, archaeological values, and recreation uses could be degraded or lost. Impacts resulting from housing shortages and overburdening of public facilities would be less than those occurring under Alternative 1; likewise, employment and revenue increases would not be as great.

Under Alternative 3, Multiple Use (Preferred Alternative), tar sand development could occur on 81,414 acres, producing about 282 million barrels of bitumen. Resultant impacts would be slightly greater than those occurring under Alternative 2. However, special stipulations for the San Rafael floodplain and riparian area would protect wildlife habitat in that area. High quality scenic areas would also be protected, as would outstanding recreation values on 30 percent of the STSA.

Alternative 4, Restricted Development, would limit tar sand development to 13,757 acres. Impacts would be similar, although to a lesser extent, than those occurring under Alternative 2. Special stipulations protecting sensitive resources, as specified in Alternative 3, would also apply to Alternative 4.

Sunnyside and Vicinity STSA (Southern Portion)

MAJOR ISSUES

Major issues related to tar sand development include: (1) surface disturbance of municipal watersheds; (2) disruption of underground aquifers; (3) loss of important wildlife habitat; (4) protection of Nine Mile Canyon Archaeological District and other archaeological areas; (5) protection of recreation, visual, and wilderness values; (7) loss of existing

pipelines and microwave sites; (8) loss of forage and vegetation for livestock and wildlife; (9) conflicts with areas containing wilderness values; and (10) split surface and mineral estates on approximately 20,000 acres.

EXISTING ENVIRONMENT

This 169,734-acre STSA is located in northeastern Carbon and southern Duchesne counties, Utah. The BLM administers tar sand and surface estates on 55,562 acres (about 33 percent) of the mineral estate and 19,348 acres (11 percent) of the oil and gas area. Air quality is classified as Class II, which allows for slight increases in air pollution levels. Climate is arid at lower elevations to somewhat humid on higher plateaus. Precipitation ranges from 6 to 30 inches annually. The STSA is located in the southwestern portion of the Uinta Basin. Topography consists mostly of extremely rugged canyons.

Tar sand is found in the upper Wasatch and lower Green River formations. The bitumen content ranges from 2 to 13 percent by weight (3.5 to 4.0 billion barrels). Oil shale is also present in significant quantities. Quantities of other minerals are insignificant. Soils within the STSA are shallow, well drained, and generally low to moderate in erodibility. Vegetation consists of riparian, aspen, mountainbrowse, sage grass, salt-shrub, and pinyon-juniper. No threatened or endangered species are known to occur in the STSA. The area is tributary to the Price River and Range and Nine Mile creeks. Water quality is good and water is used primarily for municipal, industrial, irrigation, and livestock. Principal wildlife in the area includes mule deer, elk, bighorn sheep, moose, and several upland game birds. The golden eagle and two endangered species, peregrine falcon and bald eagle, inhabit the STSA. This STSA has high value and unique value habitat for wildlife species. No agriculture lands occur. Livestock grazing occurs on eight allotments: 13,840 AUMs are provided annually. Twenty-five wild horses occupy the eastern portion.

Most of the STSA provides outstanding visual quality. Cultural resources are not well documented throughout this STSA; however, important cultural resources exist near the area, and the STSA probably contains similar prehistoric and historic values. Recreation activities include sightseeing, hiking, picnicking, camping, and hunting. Wilderness Study Areas (WSAs) occur on 4,040 acres within the eastern edge of this STSA.

ENVIRONMENTAL CONSEQUENCES

Under Alternative 1, Maximum Development, 95 percent (71,167 acres) of the STSA could be developed, producing approximately 4 billion barrels of bitumen. Air quality could be seriously degraded, extremes in topography and soil losses could occur, vegetation would probably be eliminated during project life, and water resources would be degraded. Development would impact and destroy crucial habitat for elk and deer and impair nesting habitat for golden eagles and sage grouse. Perennial streams supporting fisheries could be lost. In addition, AUMs for livestock and wildlife, scenic quality, archaeological, and recreational values could be lost. Housing shortages and overburdening of public facilities could occur, while employment and revenue could increase.

SUMMARY

Under Alternative 2, Multiple Use, development would occur on 16,161 acres, producing approximately 880 million barrels of bitumen. Air quality could be degraded, although impacts would be somewhat less than Alternative 1. Topographic features could be altered, and soil erosion from surface and vegetation disturbance could be increased. Water quality degradation could increase, although to a lesser extent than Alternative 1. Elk and deer crucial habitat could be destroyed, and perennial streams supporting fisheries habitat could be contaminated by sedimentation. Grazing AUMs for livestock and wildlife could be lost. Archaeological, scenic, and recreational values could be degraded or lost. Housing shortages and overburdening of public facilities could occur. Increases in employment and revenue could also occur, although increases would be smaller than those occurring under Alternative 1.

Under Alternative 3, Multiple Use (Preferred Alternative), bitumen could be produced on 67,269 acres. The resulting impacts would be greater than those expected under Alternative 2. Topographic alteration, soil erosion, vegetation disturbance, and water resource degradation could occur. Development could destroy crucial deer and elk summer and winter range and contaminate water. Suitable rangeland for livestock and wildlife could be lost; archaeological, scenic, and recreational values could be lost or degraded. Impacts from increased employment such as housing shortages and overburdening of public facilities could occur. These impacts would be less than Alternative 1 but greater than Alternative 2.

Alternative 4, Restricted Development, would close the entire STSA to surface mining. No surface acres would be disturbed, except as needed to develop in-situ processes on 49,098 acres. Increased soil erosion could occur on slopes less than 50 percent, and some subsidence would result because of in-situ development methods. Minor water resource degradation and minor losses of elk and deer summer and winter habitats would be expected. Vegetation loss would be minor, and rehabilitation would probably be successful. Archaeological values, recreational activities, and scenic values could be degraded somewhat; however, special category 2 stipulations would limit impacts to these resources. Because 32 percent of the STSA would be in highly restrictive leasing categories, surface disturbance, production, and related socioeconomic effects would be less than any of the alternatives described above.

White Canyon STSA

MAJOR ISSUES

The major issues related to tar sand development include visual resource degradation. Highway U-95, Utah's Bicentennial Highway, was constructed in this area because of the high visual resource values. Desert bighorn sheep habitat destruction also causes concern because development could eliminate the sheep from the area.

EXISTING ENVIRONMENT

This 8,085-acre STSA is located in west-central San Juan County between Glen Canyon National Recreation Area (NRA) and Natural Bridges National Monument. It is also

crossed by Highway U-95, Utah Bicentennial Highway. The entire area is administered by BLM. Air quality is class II which allows moderate increases in air pollution levels. However, this STSA's proximity to Class I airshed areas could limit occurrences of air degradation in this area. Climate is semi-arid, with annual precipitation ranging from 8 to 12 inches. The STSA is located on the west flank of the Monument Upwarp and consists of a gently westward-dipping plateau deeply cut by White, Red, and Dark canyons. The tar sand deposits occur in the Periam Cutler, Triassic, Moenkopi, and Chinle formations. Little study and no sampling has been completed in this area; However, estimates indicate that 12 to 15 million barrels of bitumen are in place. The White Canyon area has produced copper and uranium. No oil and gas have been produced in this STSA.

Soils are shallow and rock outcrops common. Vegetation includes pinyon-juniper, cliffrose, Mormon tea, buffalo berry, blackbrush, rabbitbrush, Indian ricegrass, and other desert-shrub community species. No threatened or endangered species are known to occur. The only perennial water is a single spring; several livestock water reservoirs also occur. This STSA is yearlong desert bighorn sheep habitat. Deer also use the area during the winter. Bald eagles are transients in the area. Livestock grazing occurs in the winter, although the STSA provides less than 277 AUMs. There is no agricultural development. Visual and cultural resources are outstanding in the area. Sites are of high prehistoric and historic value and probably contain numerous pristine cultural resources. Recreational values include hiking, sightseeing, and photography. Hunting of bighorn sheep is also an important value. Portions of the Dark Canyon WSA are also within STSA boundaries.

ENVIRONMENTAL CONSEQUENCES

Under Alternative 1, Maximum Development, 97 percent (7,805 acres) of the STSA could be developed. Fugitive dust, vehicle emissions, and processing could degrade air quality and affect nearby Class I areas. Topographic features could be altered and soil losses from vegetation removal could increase; water runoff patterns could also be altered. Displacement and disturbance of desert bighorn sheep could eliminate this species, and forage (AUMs) for livestock and wildlife could also be eliminated. Visual intrusions and impairment could be the most significant impacts. Archaeological values and recreational sightseeing could be lost. There would be no additional work force requirements and no housing shortages or overburdening of public facilities. Employment and revenue impacts in nearby areas would be insignificant.

Under Alternative 2, Multiple Use (Preferred Alternative), 97 percent (7,805 acres) of the STSA could be developed, however, special restrictions would limit mining activities on 29 percent (2,340 acres). Any development could reduce air quality standards, alter topographic features, and result in significant soil erosion, vegetation disturbance, and degradation of water resources on 3,078 acres. Any mining and development could disrupt and eliminate desert bighorn sheep. Forage production (AUMs) could be eliminated in the short term; however, this resource could be reclaimed and improved with rehabilitation. Visual resources could be modified and destroyed on 38 percent of the STSA. Archaeological values on 43 percent of the area could be lost. All recreation values could be

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maintained except sightseeing. Because the area is so small, there would be no work force requirements, employment or revenue.

Under Alternative 3, Resource Protection, 97 percent (7,805 acres) of the STSA could be developed with the exception of restrictive stipulations on 2,340 acres. Impacts to air quality, geology, topography, vegetation, and water resources would be the same as Alternative 2. Soil erosion could occur on 1,924 acres. Any mining could disrupt desert bighorn sheep. Loss to livestock grazing (AUMs) and visual degradation would be much the same as Alternatives 1 and 2. Archaeological values could be lost on 57 percent of the area. However, adverse recreational impacts would be avoided. Impacts to socioeconomic values would be similar to Alternative 1.

Circle Cliffs STSA

MAJOR ISSUES

The location of the STSA near and in Capitol Reef National Park causes concern for watershed contamination, degradation of air quality, increased ORV use, hunting, trespass, and destruction of archaeological values. Development of tar sand could destroy natural and scenic qualities in Wolverine Petrified Wood and Escalante Canyons Outstanding natural areas. Much of the Circle Cliffs area also has outstanding quality scenery which could be destroyed. Recreation areas, such as the Burr Trail, could lose their appeal because of increased traffic.

EXISTING ENVIRONMENT

The Circle Cliffs STSA is located in Garfield County, Utah. This area is remote and is characterized by rugged terrain. The STSA has a Class II air quality designation. Major recreational activities include rockhounding, day hiking, backpacking, photography, and ORV touring. Visual scenery is dominated by the Navajo sandstone and Wingate formations. Public lands within the STSA provide forage for livestock and wildlife: desert bighorn sheep were transplanted into the STSA in 1975-76 by UDWR. The major vegetation type found in the STSA is pinyon-juniper woodland. Natural water sources within the STSA are very sparse, with only three or four known springs or seeps. Soils are predominately shallow and well drained, with medium to rapid runoff and moderate to high sediment yield and erosion. Mineral values include tar sand, oil and gas, and uranium deposits. Livestock grazing, hunting, rock collecting, backpacking, hiking, and mineral activities are the major land uses in the STSA.

ENVIRONMENTAL IMPACTS

Under Alternative 1, No Action, about 1 percent of the recoverable oil resource would be foregone and some uranium deposits could be destroyed; air quality of Capitol Reef National Park could be degraded; soil erosion could be expected to increase on 27,300 acres; and forage production for both livestock and wildlife could be lost on 16,020 acres. Also, an estimated 2,500 visitor recreation days per year could be lost. Visual Resource Management (VRM) classes could be exceeded, and surface and groundwater quality and flow could be seriously impacted.

Under Alternative 2, Maximum Development, all recoverable oil could be extracted and surface mining of some uranium in the White Canyon Flat area would be eliminated. Emissions and particulate matter could degrade air quality in Capitol Reef National Park. Soil erosion could be expected to increase on 28,400 acres, while surface and groundwater quality and flow could be seriously impacted from soil erosion and in-situ mining. Approximately 17,140 acres of vegetation could be destroyed, 10 percent of the crucial deer winter range and a good portion of bighorn sheep habitat could be lost, and forage production for livestock and wildlife on 17,140 acres of vegetation could be lost. An estimated 2,500 visitor days per year could be displaced, and VRM contrast ratings could be exceeded.

Under Alternative 3, Multiple Use (Preferred Alternative), about 1 to 2 percent of the total recoverable oil resource would be foregone, and some uranium deposits could be destroyed. Air quality in Capitol Reef National Park could be degraded, soil erosion could increase on 26,000 acres, and groundwater quality and flow could be seriously impacted from in-situ mining on 610 acres. Vegetation on 14,720 acres would be destroyed, and forage production for livestock and wildlife would be lost on 14,720 acres. Also, an estimated 2,500 visitor recreation days per year could be displaced, and contrast ratings on VRM Class I areas would be exceeded.

Under Alternative 4, Restricted Development, about 5.5 to 11 percent of the total recoverable oil resource would be foregone, and some uranium deposits could be destroyed. Air quality in Capitol Reef National Park could be degraded, and soil erosion could increase on 22,600 acres. Slightly less groundwater degradation would occur than under Alternative 3. About 13,360 acres of vegetation would be destroyed, and forage production for livestock and wildlife could be lost on 13,360 acres. Contrast ratings on all lands within VRM Class I (1,480 acres) would not be exceeded, and some loss of recreational days could occur on Burr Trail and other recreation use areas.

Asphalt Ridge/White Rocks STSA

MAJOR ISSUES

A large sage grouse strutting ground and adjacent nesting habitat are located within the STSA. These habitats are of special concern and have high public interest. The STSA also contains four archaeological sites with potential for nomination to the National Register of Historic Places.

EXISTING ENVIRONMENT

The Asphalt Ridge/White Rocks STSA is located in Uintah County near Vernal, Utah. Topography consists primarily of hillsides and fan terraces, with slopes ranging from 0 to 60 percent. The STSA is within a Class II air quality designation. Major soils include Rencot, Brownsto, and Luhon. Juniper and mixed shrub are the two dominant vegetation communities. Five grazing allotments, providing 480 AUMs, are located totally or partially within the STSA. No seeps, springs, wetlands, or floodplains occur, and groundwater in the STSA is found in shallow, geologic deposits. Mineral resources include tar sand, oil and gas, sand, and gravel. Mule deer and antelope are big game

SUMMARY

species occurring within the STSA. Cultural resource values are considered high. Scenic quality has been evaluated as low with medium sensitivity: the area is rated as VRM Class IV. Recreational opportunities exist for hunting, ORV use, and sightseeing.

ENVIRONMENTAL IMPACTS

Under Alternative 1, No Action, tar sand development on 155 acres of sage grouse strutting habitat would be restricted; no impacts to other minerals would occur. Topographic features could be altered, soil erosion could increase, and vegetation could be disturbed. Archaeological values could also be lost, while landforms would be modified. AUMs on 13,014 acres would be lost, and tar sand development could occur on sage grouse nesting habitat within 1.50 miles of strutting grounds. Sage grouse hunting opportunities could also be lost. Housing shortages and overburdening of public facilities and services could be expected.

Under Alternative 2, Maximum Development, there would be no restrictions to tar sand development; however, topographic features could be altered and soil erosion increased. Also, some archaeological values could be lost, while some landforms would be modified. AUMs on 13,169 acres could be lost. One hundred and fifty-five acres of sage grouse strutting grounds could be destroyed, and sage grouse nesting habitat within 1.50 miles of strutting grounds could be developed. Some loss of sage grouse hunting opportunities, conflicts with existing rights-of-way, and housing shortages and overburdening of public facilities and services could be expected.

Under Alternative 3, Multiple Use (Preferred Alternative), tar sand development would be restricted on 40 acres of sage grouse strutting habitat. No impacts to other minerals would occur. However, topographic features could be altered, soil erosion increased, and vegetation disturbed. Landforms would also be modified, AUMs on 13,129 acres could be lost, and archaeological values on 12,929 acres could be destroyed. Sage grouse nesting habitat on 2,328 acres could be developed. Conflicts with existing rights-of-way could be expected, and housing shortages and overburdening of public facilities and services could occur. No impacts to recreational hunting would be expected.

Under Alternative 4, Restricted Development, no tar sand development could occur on 2,560 acres. However, topographic features could be altered, soil erosion increased, and vegetation disturbed on areas where development was allowed. Landforms would be modified, and archaeological, and Federal AUMs would be lost on 10,169 acres. No impacts to sage grouse nesting habitat and/or sage grouse hunting opportunities would occur. Conflicts with existing rights-of-way could occur on 10,609 acres; housing shortages and overburdening of public facilities and services could also be expected.

Pariette STSA

MAJOR ISSUES

The STSA contains public lands defined as wetlands and floodplains and waterfowl habitat. In addition, Federal lands

containing important live water also occur within the STSA. Water is scarce, and full tar sand development could interrupt water flow. Golden eagle roost sites, as well as bald and golden eagle concentration areas, occur within the STSA. These areas could require special protection if oil and gas or tar sand development occurred. In addition, the area includes a portion of the Pariette Waterfowl Management Area.

EXISTING ENVIRONMENT

The Pariette STSA is located in eastern Duchesne and western Uintah counties, northeastern Utah. Topography in the area varies from dissected benches of moderate relief to gently sloping flats of low relief. The STSA is within a Class II air quality designation. Major soils in this STSA are Motto, Muff, and Uttens. Alkaline riparian and low desert shrub are the two dominant vegetative communities. A threatened species, Uinta Basin hookless cactus, inhabits the STSA. Six grazing allotments, providing 665 AUMs, partially overlap the STSA. No seeps or springs are known to occur; streams include Wells Draw and Pariette Draw. Mineral resources include tar sand, gilsonite, oil shale, oil and gas, sand and gravel, uranium, and copper. The STSA provides habitat for deer, antelope, and waterfowl. The bald eagle, an endangered species, is a winter visitor to the area. The area contains few archaeological values and provides limited hunting opportunities for waterfowl, deer, and antelope. The major land uses in the STSA include livestock grazing and oil and gas development.

ENVIRONMENTAL IMPACTS

Under Alternative 1, No Action, special wetland and floodplain stipulations would not only restrict surface intensive development, such as surface mining, but would also protect water resources and waterfowl habitat. Tar sand development could still disturb or displace wintering bald and golden eagles, as well as destroy existing populations and potential habitat for the threatened Uinta Basin hookless cactus. In many cases, public facilities could not accommodate the expected increase in population.

Under Alternative 2, Maximum Development, open leasing would provide for maximum development of oil and gas and tar sand. Tar sand development could result in the disturbance and contamination of surface and groundwater and also damage valuable wetlands. Tar sand development could disturb or displace wintering bald and golden eagles as well as destroy existing populations and potential habitat for the threatened Uinta Basin hookless cactus. In many cases, public facilities could not accommodate the expected increases in population from tar sand development.

Under Alternative 3, Multiple Use (Preferred Alternative), protection of renewable resources would not unreasonably interfere with current development. Special stipulations would protect wetlands, floodplains, and wildlife habitat. If the Uinta Basin hookless cactus were found on any site proposed for disturbance, the site could be moved or plant populations relocated. Again, in many cases, public facilities could not accommodate the expected increases in population resulting from tar sand development.

Under Alternative 4, Restricted Development, recovery of tar sand could be eliminated; however, no impacts to

SUMMARY

other mineral resources would be expected. Special stipulations would provide the maximum amount of protection to water resources, wildlife habitat, and vegetation. In addition, because of leasing restrictions, socioeconomic impacts would be significantly less than the other alternatives.

Argyle Canyon/Willow Creek STSA

MAJOR ISSUES

The STSA contains crucial summer range for elk and mule deer, as well as sage grouse strutting and nesting habitat. The STSA also contains protected wetlands and floodplains. Soils within the STSA have a high erosion hazard and require special protective measures.

EXISTING ENVIRONMENT

The Argyle Canyon/Willow Creek STSA is located in southwestern Duchesne County, about 18 miles north to 23 miles north-northeast of Price, Utah. The topography is mountainous, with most of the area containing slopes ranging from 40 to 70 percent. The STSA is within a Class II air quality designation. Major soils are Midfork, GT, JS, ET, Adel, and Podo. Floodplains in the STSA are found along Argyle and Willow Creeks, the only perennial streams in the area. Vegetation types range from Douglas fir and aspen stands at the higher elevations near the northern boundary down to the big sagebrush-grass community along Argyle Creek. Important wildlife species include mule deer, elk, and sage grouse. The area also contains potential peregrine falcon habitat. Scenic quality has been evaluated as A (high) in the foreground-middleground zone relative to the travel corridors of U.S. Highway 191. Little is known about archaeological values in the STSA. No developed recreation sites exist; however, hunting opportunities are available for grouse, deer, and elk. The only Federal right-of-way is for a road on the extreme northern portion of the area. Both Duchesne and Utah counties have zoning ordinances regulating development within their counties.

ENVIRONMENTAL IMPACTS

Under Alternative 1, No Action/Development, tar sand development could occur on 12,877 acres, with an estimated production of 3 to 5 million barrels of oil. No restrictions would be placed on other mining activities. Topographic features could be altered, while soil erosion would be increased. Vegetation could be disturbed, landforms modified, and recreational opportunities lost. Existing land use plans would be changed on 12,877 acres. All Federal AUMs on suitable livestock grazing areas could be lost, and approximately 12,193 acres of mule deer and elk crucial summer range and crucial sage grouse habitat could be destroyed.

Under Alternative 2, Multiple Use (Preferred Alternative), no tar sand development could occur on slopes greater than 40 percent. Topographic features could be altered, soil erosion increased, and vegetation disturbed. Crucial elk and deer summer range could be destroyed. Grazing AUMs could be lost and landforms modified. Existing land use plans would require alteration. No impacts would occur to water resources.

Under Alternative 3, Restricted Development, no impacts to other resource values would occur because mineral development would not be allowed.

Sunnyside STSA (Northern Portion)

MAJOR ISSUES

The major issues related to the tar sand development with the STSA include: (1) high erosion hazard soils requiring special protective measures; (2) water resources requiring special protection and enhancement (wetlands and floodplains); (3) protection of Nine Mile Canyon which is nationally known for rock art, and the Nine Mile Archaeological District; (4) protection of threatened Uinta Basin hookless cactus; and (5) special management of recreation and visual resources of Nine Mile Canyon to insure retention of present values.

EXISTING ENVIRONMENT

This 33,072-acre area is located in southern Duchesne County, Utah and is administered by BLM. Air quality is Class II and allows for moderate increases in air pollution. The climate is semi-arid; precipitation ranges from 10 to 12 inches annually. This area is located on the southwest limb of the Uinta Basin and the homoclinal dips 3° to 10° to the northeast. Tar sand deposits are found in the Wasatch formation of the Roan Cliffs and are 3,750 feet thick. Overall topography is rugged with steep canyon walls exceeding 100-percent slope. The principle oil-impregnated zones are the Deltaic facies and Parachute Creek member of the Green River formations in Minnie Maud Creek, Argyle Canyon, and Nine Mile Canyon. The bitumen content in these areas is estimated at 65 to 95 million barrels. There is no current oil and gas production in this area. The STSA has moderate use for building stone. Major soils are shallow, well drained, badland types on steep nonstony lands. Soil productivity is low, and reclamation potential is poor. Vegetation consists of cottonwood, willow, tamarisk, greasewood, saltgrass, and sagebrush, saltbush, alpine fir, and aspen. The threatened Uinta Basin hookless cactus is found in this area. The principle wildlife species is mule deer. Potential habitat for desert bighorn sheep also occurs. The bald eagle is an occasional visitor in the STSA. This area is VRM Class II and Class IV scenery, and archaeological rock art is present throughout the area. Agriculture lands are located along Nine Mile Creek, and 805 AUMs are grazed on seven allotments. Several springs and seeps are found: these are important water sources for livestock and wildlife. Nine Mile Creek is the only perennial stream. Groundwater is relatively unimportant except for recharge areas for springs and seeps. Nine Mile Canyon Archaeological District is listed on the National Register of Historic Places, and archaeology is an important resource. No developed recreation sites exist. Hunting and sightseeing are the primary uses.

ENVIRONMENTAL CONSEQUENCES

Under Alternative 1, Maximum Development, 33,072 acres could be developed, producing from 65 to 95 million barrels of bitumen. Air quality was not evaluated, but past

SUMMARY

experience would suggest that development and production would degrade the air resource to less than the Class II designation. Topographic features could be altered, depending on the level of development. Soil and vegetation disturbance could occur on 33,072 acres, and loss of the Uinta Basin hookless cactus and its major habitat could be significant. Development could degrade wetlands, floodplains, and interrupt spring flows. Development could cause loss of deer and raptor habitat. Livestock grazing on eight allotments could be affected. Visual and cultural values could be destroyed and recreation values lost. Overburdening of public facilities could occur in Carbon or Duchesne counties; however, there could also be increases in employment and revenue.

Under Alternative 2, Restricted Development, there are restrictive stipulations for 23,412 acres (71 percent) in the STSA. The remaining 9,660 acres would be open to leasing. Any development would degrade the air quality and alter topographic features on approximately 16,872 acres. Soil and vegetation disturbance could occur on 16,872 acres; however, most of the Uinta Basin hookless cactus habitat would be protected. Water resources, with the exception of spring recharge areas, would be protected. There could be a slight loss of deer and raptor habitats. Livestock grazing

would be slightly affected, although most of the suitable grazing areas would be undisturbed. Visual resource values could also be slightly affected. Cultural and recreation values could be affected, although to a lesser degree than Alternative 1. Socioeconomic impacts would be similar, although less in magnitude, to Alternative 1.

Under Alternative 3, Multiple Use (Preferred Alternative), approximately 9,600 acres would be open for leasing and development. This scaled-down development could reduce impacts to air quality; however, some deterioration could occur. Topographic and geologic features could be altered on about 9,600 acres. The soil resource would be given maximum protection, and accelerated erosion could be minimized. Vegetation impacts could occur in the development area but disturbance could be much less than Alternative 1 or 2. Disturbance of the Uinta Basin hookless cactus habitat would be controlled and water resources would be protected. Deer and raptor habitat could be protected on 71 percent of the STSA, reducing adverse affects significantly. No impacts on visual resources or livestock grazing are expected, nor are important cultural resources expected to be impacted. Impacts to recreation and socioeconomic could be the same as under Alternative 2.

CHAPTER 1

INTRODUCTION

INTRODUCTION

Volume II of this environmental impact statement (EIS) contains proposals for amending leasing categories in Bureau of Land Management (BLM) land use plans (Management Framework Plans [MFPs]). These amendments are necessary because original categories considered only oil and gas leasing; tar sand recovery was not analyzed. Amended categories will determine which areas will be open for new hydrocarbon leases (oil and gas and tar sand) and which existing oil and gas leases will be converted to Combined Hydrocarbon Leases (CHLs). Three BLM Districts (i.e., Moab, Cedar City, and Vernal) require updates of their land use plans.

Present category designations on seven of the 11 Special Tar Sand Areas (STSAs) (see Glossary) existing within Utah require recategorization. Of the remaining four STSAs, one was recategorized in the recently completed Henry Mountain MFP (Richfield District), and three (Raven Ridge/Rim Rock, Hill Creek, and P. R. Spring) will be evaluated for recategorization in a Resource Management Plan (RMP) (see Glossary) being prepared in the Book Cliffs Resource Area (Vernal District).

Chapter 1 of this volume includes the following: (1) a brief explanation of purpose and need for this environmental impact statement (EIS); (2) a description of the planning process and criteria used for development of category amendments; (3) a brief description of each STSA (see Glossary); and (4) a brief summary of environmental consequences resulting from implementation of each alternative. Chapter 2 contains site-specific data for each STSA requiring recategorization. Data for each STSA describes the following in detail: (1) major issues; (2) proposed alternatives, including the preferred alternative; (3) the existing environment; and (4) environmental consequences.

Only significant resources, resource uses, or environmental consequences are discussed in this EIS. This is in accordance with Section 43 of the Code of Federal Regulations (CFR) 1500.2(b), which instructs Federal agencies: "...to reduce paperwork and the accumulation of extraneous background data; and to emphasize real environmental issues and alternatives." For an impact to be significant, it must substantially affect the human environment, be of high public concern, be controversial, or be covered by law.

PURPOSE AND NEED

Oil and gas category designations were prepared for each district in 1975 and 1976. During the districtwide environmental assessment (EA) process, public lands were designated as category 1, open to leasing with standard stipulations; category 2, open to leasing with special stipulations; category 3, open to leasing with no right of surface occupancy; and category 4, closed to leasing. (See Glossary for a detailed explanation of each category and the restrictions for each.) These districtwide EAs allowed issuance of oil and gas leases without separate EAs.

The Combined Hydrocarbon Leasing Act of 1981 (Public Law 97-78) amended the Mineral Lands Leasing Act of 1920 (as amended and supplemented) to establish a competitive CHL program for designated STSAs. (Figure 1-1 shows locations of designated STSAs.) In addition, this Act gave holders of Federal oil and gas leases issued on or before November 16, 1981 the opportunity to convert their leases to CHLs, if their leases occurred within designated STSAs.

Because oil, gas, and tar sand are now recoverable under the same lease (either converted oil and gas lease or competitive CHL), those areas known to contain tar sand resources must be reanalyzed and a revised category system established which considers additional impacts resulting from tar sand recovery methods.

CONFORMANCE STATEMENT

As stated previously, current MFPs do not consider tar sand leasing or development; therefore, all MFPs for areas known to contain tar sand must be amended. Following completion of the Final EIS, decisions on new leasing categories will be made by the affected District Managers. At that time, MFPs will be amended to reflect the new leasing categories.

PLANNING PROCESS AND CRITERIA

The planning process to establish and/or revise categories includes the following steps:

1. Establishment of STSA boundaries by Minerals Management Service (MMS). (MMS became part of BLM in 1983.)
2. Data collection.
3. Public scoping and issue identification.
4. Development of draft leasing categories by individual BLM district offices.
5. Draft EIS.
6. Public comment and review.
7. Final EIS.
8. Final decision and MFP amendment

This EIS marks the culmination of steps 1 through 5 of the planning process.

Planning criteria are based primarily on the General Policy Guidelines for Oil and Gas Leasing (see Appendix 1). There are, however, some general modifications to those guidelines because they address only oil and gas exploration and development and do not consider tar sand. Impacts from surface mining or in-situ extraction of tar sand would be greater than impacts resulting from oil and gas

development. Additional mitigation measures would, therefore, be required. These measures would be specified in lease stipulations.

Development of Alternatives for STSAs

The three district offices involved (Moab, Cedar City, and Vernal) assigned interdisciplinary teams in each affected resource area to develop category alternatives amending MFPs in each STSA. (Tables 1-1 through 1-3 show, by district, the list of preparers for category amendments). Analysis for recategorization included review of existing oil and gas leasing categories and consideration of new resource information within the STSAs. Because the analysis was completed by three different interdisciplinary teams and because the resources in each STSA are different, issues identified as significant vary for each STSA. Also, the writing style differs slightly between each district.

The interdisciplinary teams used the following methodology to develop category alternatives and lease stipulations:

- Existing oil and gas categories were reviewed and reevaluated, based on potential impacts from tar sand exploration and development. Primarily, two types of extraction were considered: surface mining and in-situ extraction with surface wells.
- Impacts to sensitive resource values were analyzed in detail. Analysis began using category 1, which provided the least amount of protection, then progressed through categories 2, 3, or 4 until adequate protection of affected resources was ensured.
- Stipulations were then developed for each category. These stipulations were made as nonrestrictive to development as possible allowing adequate protection of sensitive resources.

Leases being converted to CHLs in areas where no leasing (category 4) is proposed would be issued as category 3 for the balance of the lease term.

SCOPING

Previous analysis, planning, and public involvement were considered in alternatives proposed for category redesignation. For example, the Green River Management Plan was released in 1979 after nearly 2 years of public review and various agencies' involvement. In that plan, several management decisions were made which related directly to oil and gas activities in the Green River corridor. Direct participation from oil and gas companies was considered in analysis and was part of the official record for that management plan. This influenced the draft category recommendation made in that management plan. (See also Volume I, Scoping Process.)

DESCRIPTION OF STSAs

Moab District

Category revisions for the following three STSAs in the Moab District are being considered in this EIS: (1) San Rafael Swell; (2) Sunnyside and Vicinity; and (3) White Canyon.

SAN RAFAEL SWELL STSA

San Rafael Swell STSA was designated on September 23, 1980 in the *Federal Register* (FR), by MMS, formally U.S. Geological Survey (USGS). The STSA is located in central Emery County and encompasses approximately 130,691 acres (see Figure 1-2). This STSA is administered by the San Rafael Resource Area, Moab District. Administrative offices are located in Price, Utah.

BLM administers 115,233 acres (88 percent) of the tar sand and surface estates in the San Rafael Swell STSA. BLM has not retained the tar sand on 472 acres (0.4 percent). The State of Utah administers approximately 14,986 acres (approximately 12 percent) of the STSA.

SUNNYSIDE AND VICINITY STSA

Sunnyside and Vicinity STSA was designated by MMS on September 23, 1980 (45 FR 76800). This STSA is located in northeastern Carbon and southern Duchesne counties, Utah and encompasses approximately 169,734 acres in Carbon County (see Figure 1-3). STSA public lands within Carbon County are managed by BLM's Price River Resource Area (Moab District). The northern portion of the STSA is managed by the Vernal District.

Surface estate ownership within the Sunnyside STSA is complex. Of the total 169,734 acres, BLM administers 55,562 acres (33 percent) of the mineral estate. On an additional 19,348 acres (11 percent), BLM administers the oil and gas resources but does not manage tar sand or surface rights.

WHITE CANYON STSA

White Canyon STSA was designated by USGS on September 23, 1980 (45 FR 76800). This STSA is located in San Juan County and encompasses 10,536 acres (see Figure 1-4). It is administered by BLM, San Juan Resource Area in Monticello, Utah.

Ownership of White Canyon STSA is primarily BLM, with some State of Utah acreage. Approximately 8,085 acres are administered by BLM and 1,299 acres are administered by the State of Utah. Private land within the STSA accounts for 52 acres.

Cedar City District

Cedar City District was responsible for developing alternatives for category amendments on the Circle Cliffs STSA.

CIRCLE CLIFFS STSA

Circle Cliffs STSA is located in south-central Utah in Garfield County, about 30 miles east of the Town of Escalante, in townships 33 through 36 South and Ranges 6 through 9 East (see Figure 1-5). Access to the area is by graded roads from the northeast and southeast through Capitol Reef National Park to the Burr Trail and from the west from Boulder over graded roads to the Burr Trail

Circle Cliffs STSA comprises approximately 91,080 acres. Of these, 50,760 acres are administered by BLM's Escalante Resource Area (Cedar City District). Of the remaining acreage, 26,720 are in Capitol Reef National Park

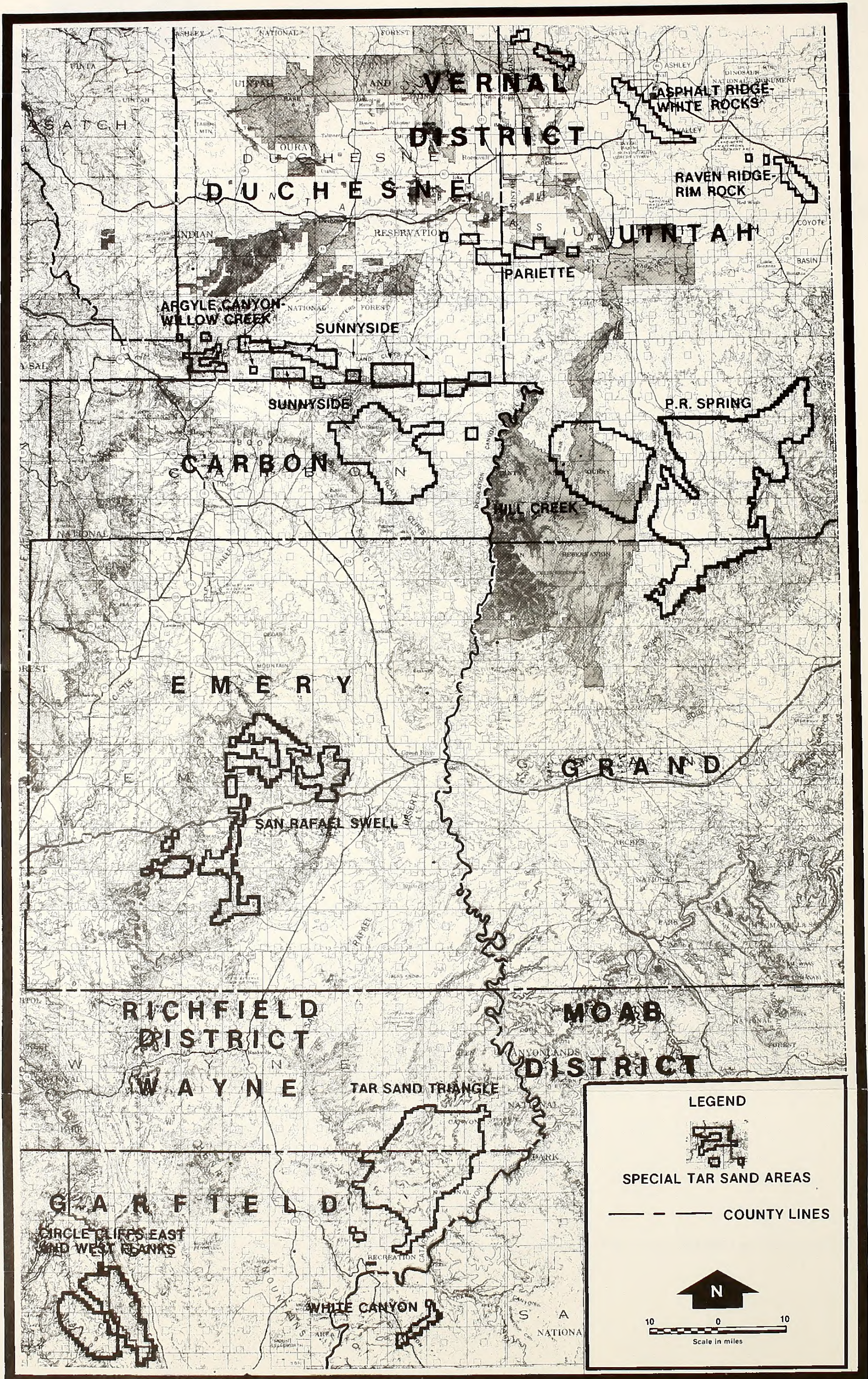


FIGURE 1-1
SPECIAL TAR SAND AREAS IN UTAH

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TABLE 1-1

Moab District Category Amendments
List of Preparers

Individual	Project Assignment	Education	Years of Professional Experience
Jesse M. Purvis	Water Resources, Climate	B.S. Hydrology	5 years
Mark A. Mackiewicz	Realty, Soils	B.S. Soil Scientist	7 years
James Kenna	Recreation, Wilderness, Visual Resource Management	B.S. Recreation Planner	8 years
David L. Mills	Wildlife	B.S. Wildlife Mgnt.	5 years
Dennis J. Willis	Vegetation, Livestock Grazing, and Wild Horses	B.S. Range Mgnt.	7 years
Blaine Miller	Cultural Resources	B.S. Archaeology	8 years
Sid Vogelpohl	Planning Team Leader, Minerals	B.S. Geology	6 years

TABLE 1-2

Vernal District Category Amendments
List of Preparers

Individual	Project Assignment	Education	Years of Professional Experience
Brad Palmer	Team Leader	B.S. Geology	8 years
Bob Ruesink	Air Quality, Aquatic Wildlife, Water Quality	M.S. Fisheries	10 years
Jean Nitschke Sinclear	Grazing and Vegetation	B.S. Range Science	4 years
Steve Madsen	Terrestrial Wildlife	B.S. Wildlife Biology	4 years
Blaine Phillips	Archaeology	M.A. Anthropology	10 years
Keith Chapman	Soils	M.S. Agronomy	26 years
David Saupe	Visual Resources	M.S. Landscape Architecture	18 years
Jim Paugh	Lands and Realty	B.S. Forest Management	10 years

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TABLE 1-3

Cedar City District Category Amendments
List of Preparers

Individual	Project Assignment	Education	Years of Professional Experience
Ronald Hooper	Hydrologist	B.S. Range Hydrology	5 years
Pete Wilkins	Planning Coordinator	B.S. Renewable Resources	4 years
Mark Stiles	Regional Economist	B.S. Wildlife Biology M.S. Economics	2 years
Steve Hedges	Wildlife Biologist	B.S. Wildlife Biology	10 years
Dale Ross	Botanist	B.S. Range Mgmt.	19 years
Paul Boos	Recreation/Forestry	M.F. Forestry	12 years
Max Hodson	Soil Scientist	B.S. Soil Science	15 years
Gardner Dally	Archaeologist	M.A. Anthropology	5 years
Paul Carter	Geologist	PhD Geology	5 years

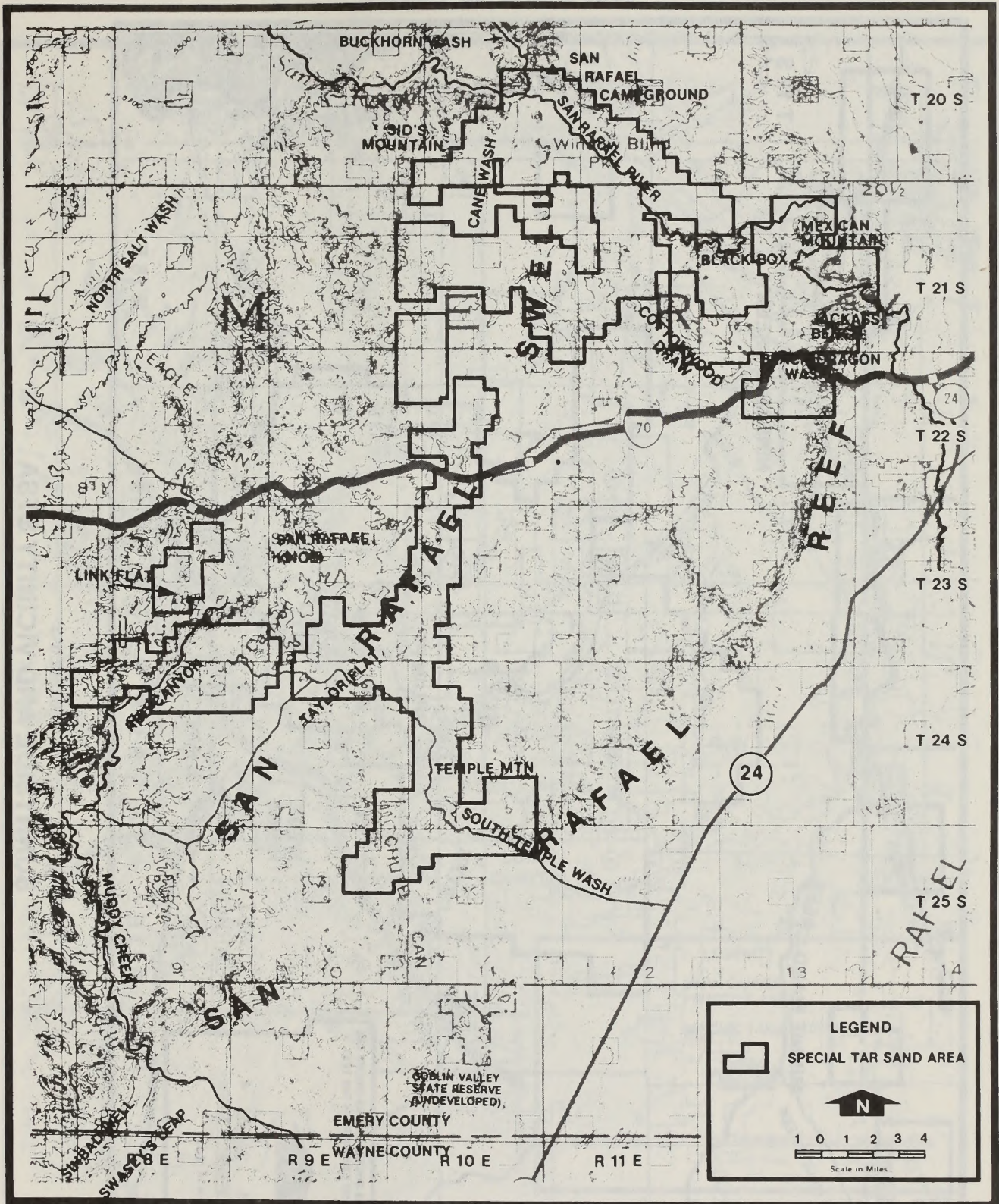


FIGURE 1-2
SAN RAFAEL SWELL STSA

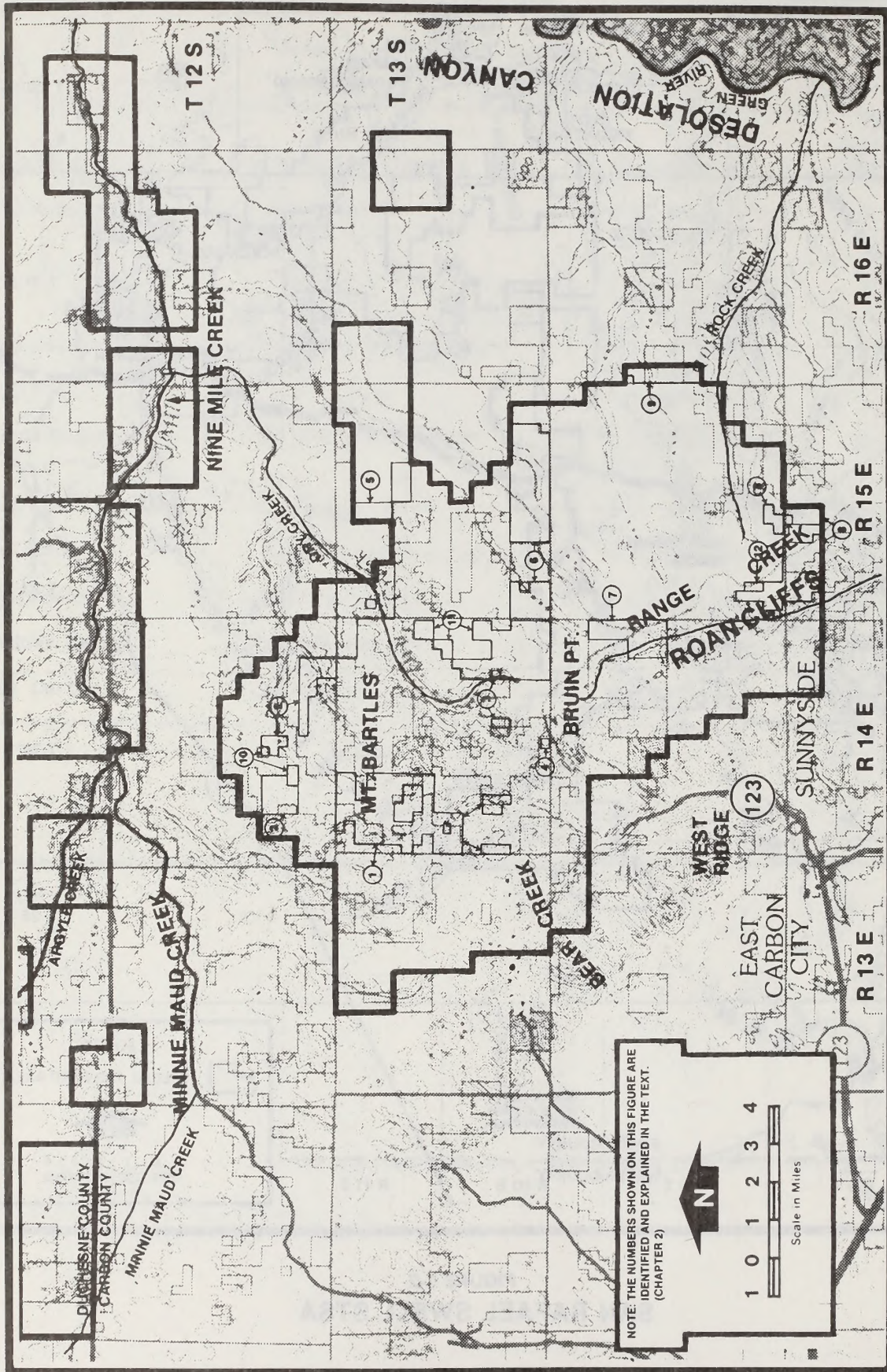


FIGURE 1-3
SUNNYSIDE AND VICINITY STSA

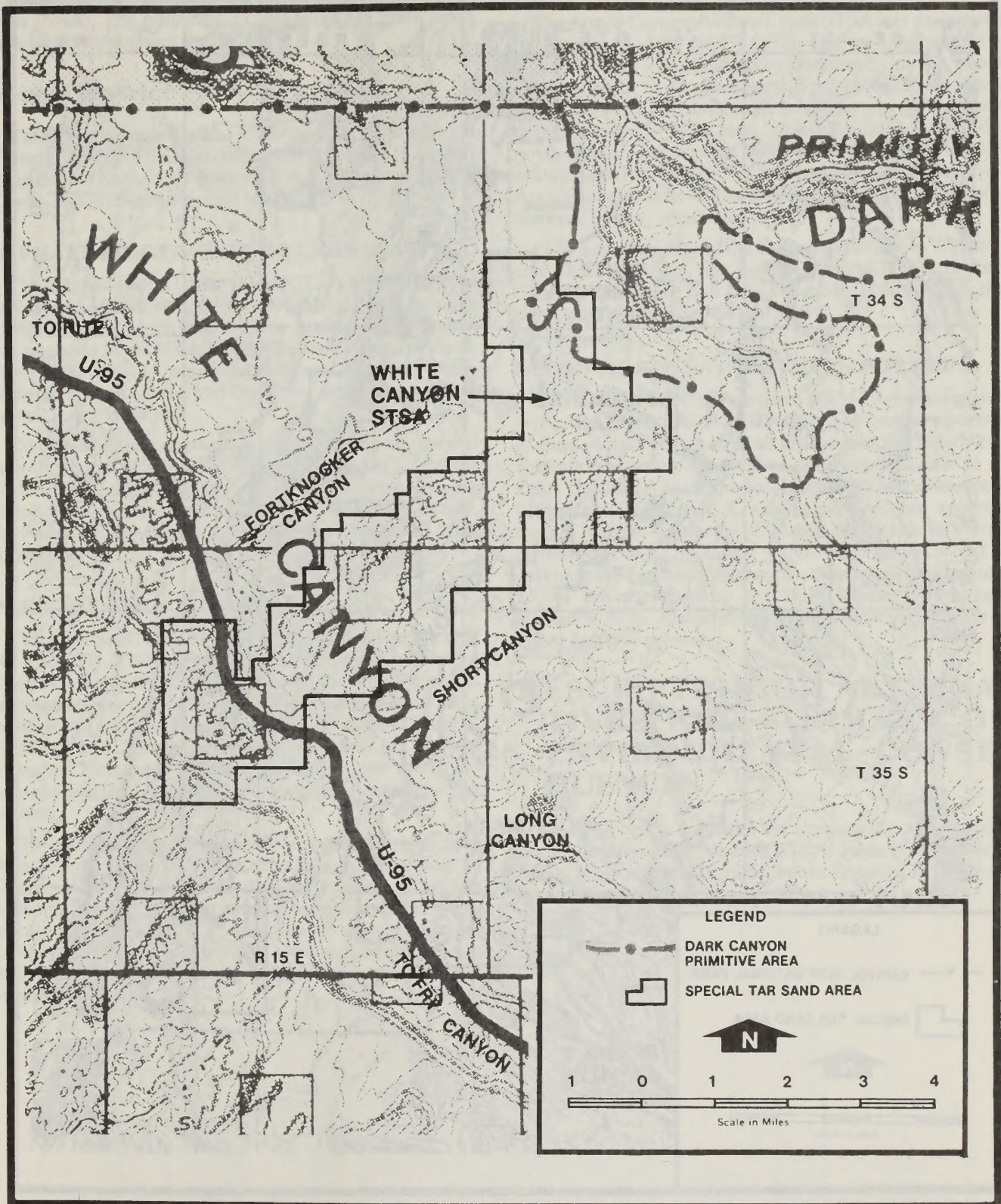


FIGURE 1-4
WHITE CANYON STSA

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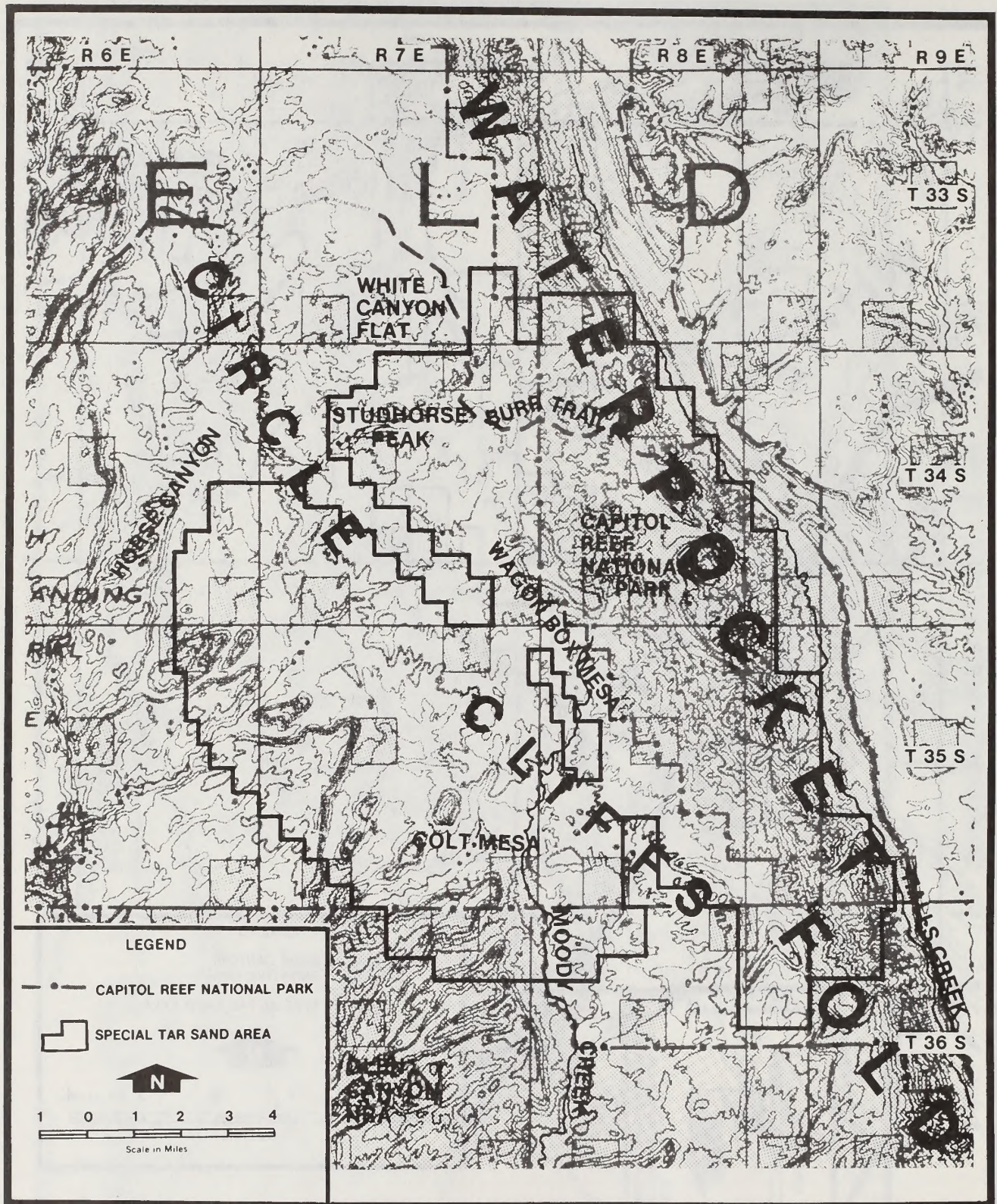


FIGURE 1-5
CIRCLE CLIFFS STSA

and 1,840 are within Glen Canyon National Recreation Area (NRA). The remaining 11,760 acres are State lands distributed throughout the STSA.

Vernal District

Category revisions for the following four STSAs in the Vernal District are being considered in this EIS: (1) Asphalt Ridge/White Rocks; (2) Pariette; (3) Argyle Canyon/Willow Creek; and (4) Sunnyside and Vicinity.

ASPHALT RIDGE/WHITE ROCKS STSA

The Asphalt Ridge/White Rocks STSA was designated on November 20, 1980 (45 FR 76800). This STSA includes 41,395 acres, of which 13,169 in the Asphalt Ridge portion are managed by BLM Diamond Mountain Resource Area. Ownership for the remaining acreage is either State, National Forest, Uintah and Ouray Indian Reservation, or private (see Figure 1-6).

Oil-impregnated sandstone is exposed along an outcrop near the mouth of White Rock Canyon, 22 miles northwest of Vernal, and along Asphalt Ridge in a northwest-southeast direction for a distance of about 13 miles. Relative to Vernal, the Asphalt Ridge deposit is 3 miles southwest to 10 miles southeast.

PARIETTE STSA

The Pariette STSA was designated on January 21, 1981 (46 FR 6077). This tar sand deposit is located in eastern Duchesne and western Uintah counties. The deposit is scattered over an area about 20 miles east-west by 4 miles north-south and encompasses 22,071 acres (see Figure 1-7). About 12,312 acres are managed by the BLM Diamond Mountain Resource Area. Ownership for the remaining acreage is State, Uintah and Ouray Indian Reservation, or private.

The center of the deposit is located about 8 miles southeast of the Town of Myton, 23 miles east-southeast of Duchesne and 15 miles south of Roosevelt. The line between Duchesne and Uintah Counties approximately bisects the deposits. U.S. Highway 40 passes through Duchesne, Myton, and Roosevelt, and the deposit is accessible via State Highways 53 and 216 and numerous seasonal roads.

ARGYLE CANYON/WILLOW CREEK STSA

The Argyle Canyon/Willow Creek STSA was designated on January 21, 1982 (46 FR 6077). This tar sand deposit is mostly located in southwestern Duchesne County, about 18 miles north to 23 miles north-northeast of Price, Utah (see Figure 1-8). The deposit is scattered over an area approximately 19 miles long, east-west, by 5 miles wide, north-south. Total acreage includes 21,863, of which 12,877 are managed by the BLM Diamond Mountain Resource Area. Ownership for the remaining acreage is either State, National Forest, or private.

Only a small portion of the deposit extends into Wasatch and Utah counties. The eastern portion of the deposit (Ranges 12-13 East, Salt Lake Meridian) is included in the Sunnyside and Vicinity STSA.

SUNNYSIDE STSA (NORTHERN PORTION)

The Sunnyside STSA (northern portion) was designated on November 20, 1980 (45 FR 76800). The northern portion of Sunnyside STSA is located in Township 11 South and spreads from west to east through Ranges 12 East to 17 East. This STSA lies immediately adjacent to the southern boundary of Duchesne County and is located approximately 70 miles southwest of Vernal (see Figure 1-3). That portion of the STSA falling within the Vernal District is estimated to contain 56,809 acres, of which approximately 33,043 are managed by the BLM Diamond Mountain Resource Area. Ownership for the remaining acreage is either State or private.

DESCRIPTION OF ALTERNATIVES AND SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Table 1-4 briefly describes the alternatives, including the preferred alternative, for each STSA. Table 1-5 briefly describes environmental consequences resulting from implementation of the various alternatives.

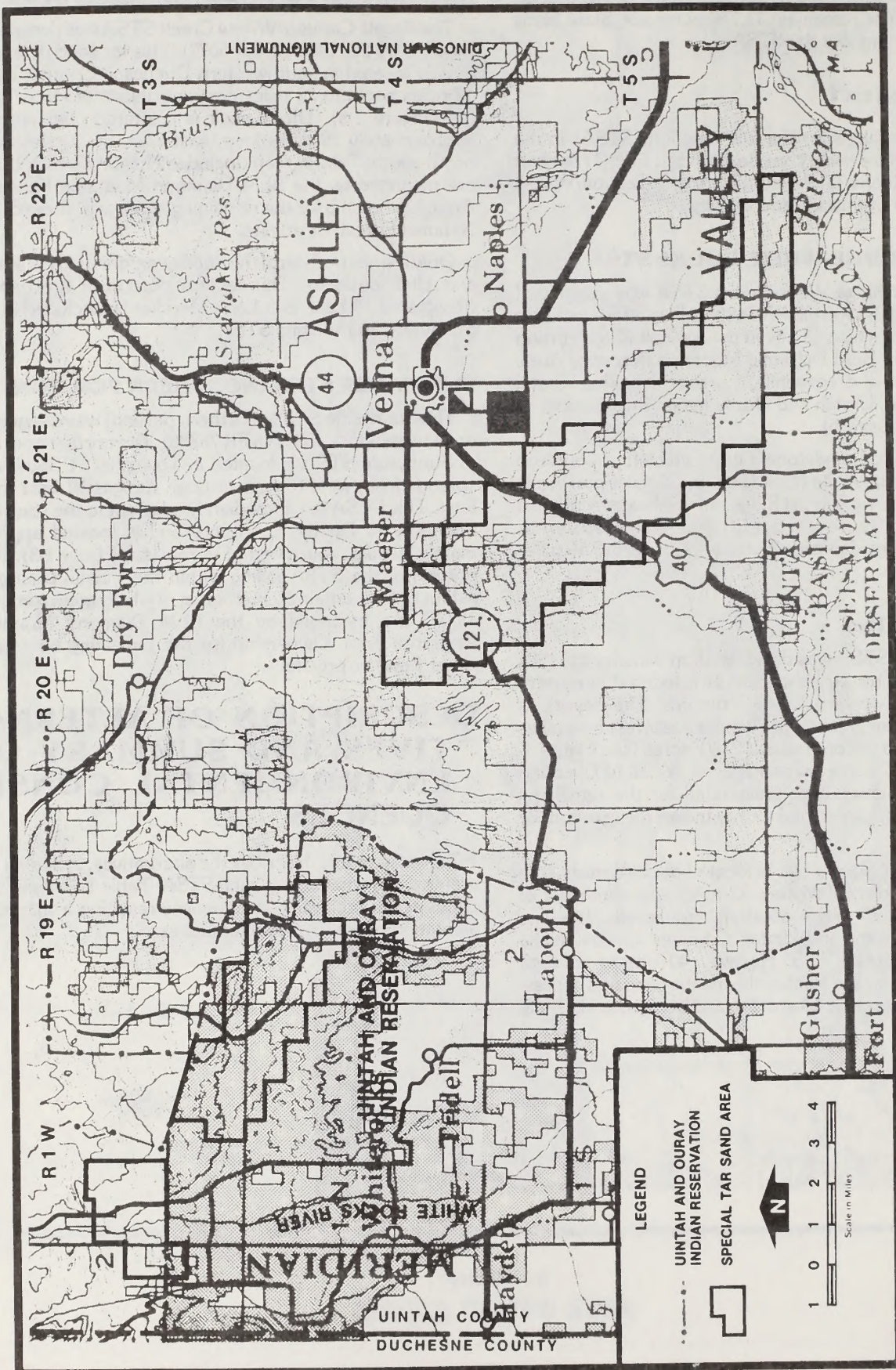


FIGURE 1-6
ASPHALT RIDGE/WHITE ROCKS STSA

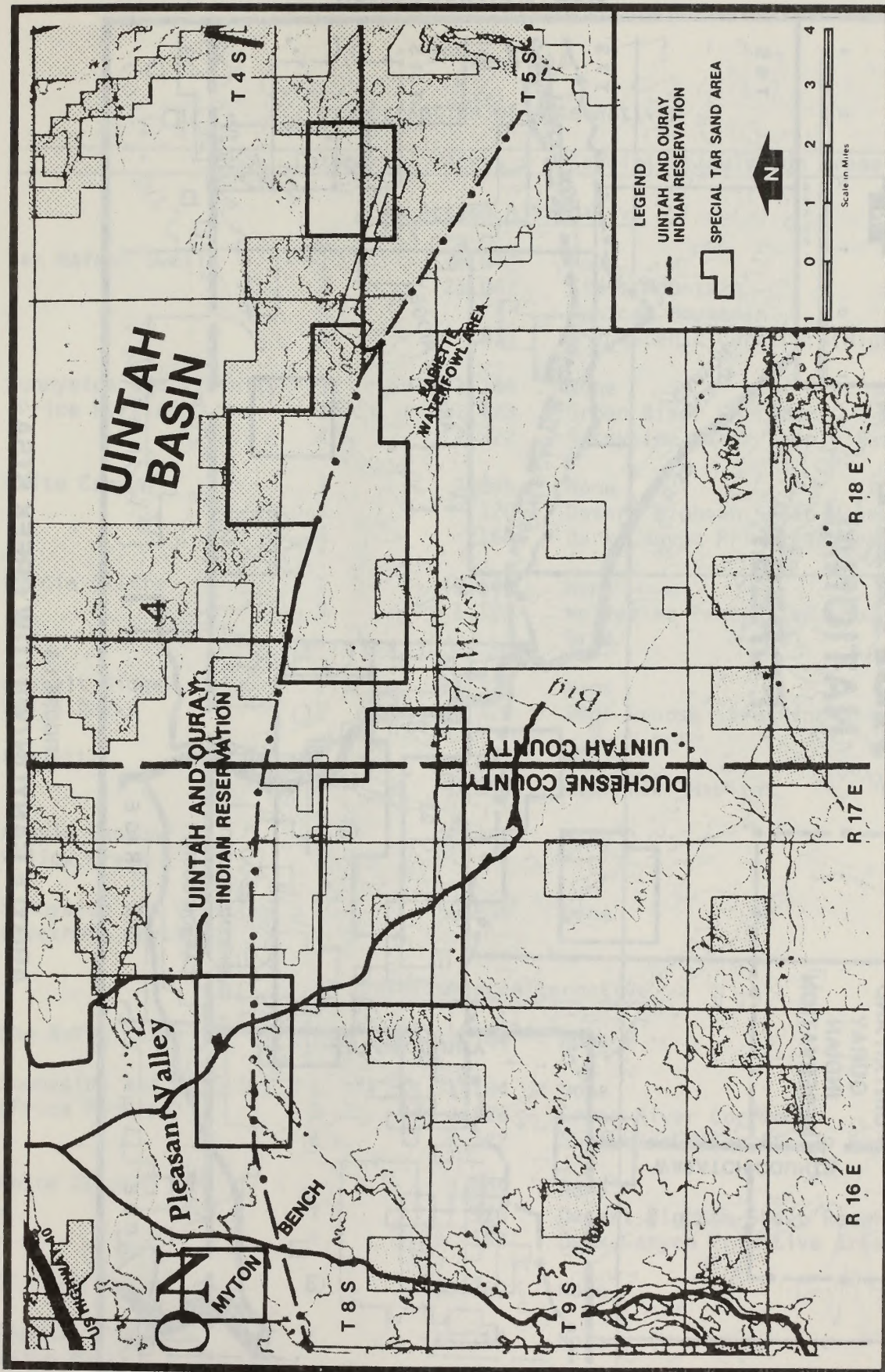


FIGURE 1-7
PARIETTE STSA

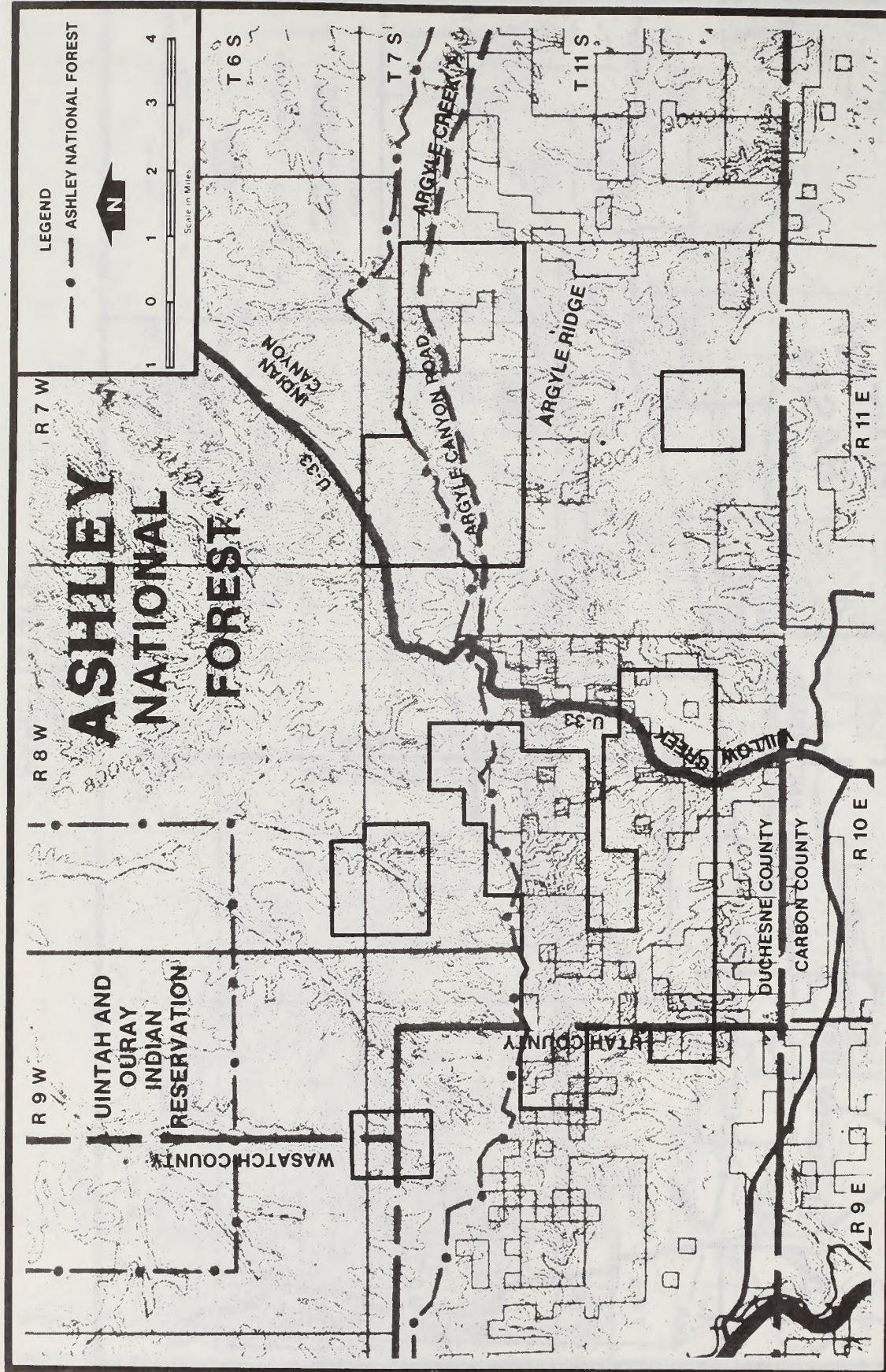


FIGURE 1-8
ARGYLE CANYON/WILLOW CREEK STSA

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TABLE 1-4

Description of Alternatives

	Category	Acres	Special Stipulation Areas
<u>No Action Alternative</u>			
San Rafael Swell	1	76,842	None
	3	21,047	Sid's Mountain Mexican Mountain
	4	17,816	I-70 Scenic Corridor (Highway)
Sunnyside and Vicinity (Price Portion) ^a	1	71,164	None
	2	1,423	Green River Corridor
	4	2,322	Sunnyside Water Supply Reserve
White Canyon ^a	1	7,805	None
	3	120	Desert Bighorn Sheep Reserve
	4	160	Dark Canyon Primitive Area
Circle Cliffs	1	49,640	None
	3	1,120	Wolverine Petrified Wood Natural Area
Asphalt Ridge/ White Rocks	1	11,129	None
	2	1,720	Sage Grouse Strutting Grounds
Pariette	1	8,871	None
	2	5,200	Waterfowl Habitat
Argyle Canyon/ Willow Creek	1	21,863	None
Sunnyside and Vicinity (Northern Portion)	1	56,809	None
<u>Development Alternative</u>			
San Rafael Swell	1	115,705	None
Sunnyside and Vicinity (Price Portion) ^b	1	71,164	None
	2	1,423	Green River Corridor
	4	2,322	Sunnyside Water Supply Reserve
White Canyon ^b	1	7,805	None
	3	120	Desert Bighorn Sheep Reserve
	4	160	Dark Canyon Primitive Area
Circle Cliffs	1	50,760	None
Asphalt Ridge/ White Rocks	1	13,169	None

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TABLE 1-4 (continued)

STSA	Category	Acres	Special Stipulation Areas
Pariette	1	14,071	None
Argyle Canyon/ Willow Creek	1	21,863	None
Sunnyside and Vicinity (Vernal Portion)	1	56,809	None
<u>Multiple-Use Alternative (Preferred Alternative)</u>			
San Rafael Swell	1	81,414	None
	2	6,663	San Rafael River Muddy Creek
	3	8,861	San Rafael Campground Mexican Mountain Sid's Mountain Muddy Creek I-70 Scenic Corridor South Temple Wash Material Site
	4	18,767	Parts of Mexican Mountain, Sid's Mountain, Muddy Creek, and I-70 Scenic Corridor.
Sunnyside and Vicinity (Southern Portion)	1	0	None
	2	67,144	Sunnyside Water Supply Reserve Sage Grouse Strutting Grounds Range Creek Watershed Jack Creek Watershed Nine Mile Canyon Archaeological District Roan Cliffs Elk and Deer Summer Range Deer Winter Range
	3	7,641	Bear and Rock Creek Watersheds Golden Eagle Nest Parts of Sage Grouse Strutting Grounds, Jack Creek Watershed, and Nine Mile Canyon Archaeo- logical District.
	4		
White Canyon ^a	1		None
	2		None
	3		None
	4		None

TABLE 1-4 (continued)

STSA	Category	Acres	Special Stipulation Areas
Circle Cliffs	1	35,160	None
	2	3,240	Sensitive Watershed (Capitol Reef National Park)
	3	11,240 1,120	Circle Cliffs (Visual Resources) Wolverine Petrified Wood Natural Area
Asphalt Ridge/	1	10,729	None
White Rocks	2	2,400	Sage Grouse Strutting Grounds
	3	41	Sage Grouse Strutting Grounds
Pariette	1	10,078	None
	2	3,993	Wetlands or Floodplains Well Area Bald and Golden Eagle Habitats Golden Eagle Nest Site Uinta Basin Hookless Cactus
Argyle Canyon/	1	21,070	None
Willow Creek	2	793	Soil and Watershed Protection
Sunnyside and Vicinity (Northern Portion)	1	22,379	
	2	34,480	Soil and Watershed Protection Soil-Wetlands and Floodplains Water Resources - Springs and Water Holes Nine Mile Canyon Archaeological District Uinta Basin Hookless Cactus Visual Resources
<u>Restricted Development and Resource Protection Alternatives</u>			
San Rafael Swell	1	67,657	None
	2	20,420	San Rafael River Muddy Creek Temple Mtn./Goblin Valley
	3	8,861	San Rafael Campground Mexican Mountain Sid's Mountain Muddy Creek I-70 Scenic Corridor
	4	18,767	South Temple Wash Material Site Parts of Mexican Mountain, Sid's Mountain, Muddy Creek, and I-70 Scenic Corridor.

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TABLE 1-4 (continued)

STSA	Category	Acres	Special Stipulation Areas
Sunnyside and Vicinity (Southern Portion) ^a	1	0	None
	2	48,610	Roan Cliffs Elk and Deer Summer Range Deer Winter Range Nine Mile Canyon Deer Winter Range
	3	20,918	Public Water Reserves Sage Grouse Strutting Grounds Bear and Rock Creek Watersheds Golden Eagle Nest Aspen Community Range Creek Watershed Jack Creek Watershed Nine Mile Canyon Archaeological District
	4	4,903	Sunnyside Water Supply Reserve Parts of Public Water Reserves, Range Creek Watershed, and Nine Mile Canyon
Asphalt Ridge/ White Rocks	1	10,729	None
	3	2,440	Sage Grouse Strutting Grounds
Pariette	1	10,078	None
	3	3,993	Wetlands or Floodplains Well Areas Bald and Golden Eagle Habitats Golden Eagle Nest Site Uinta Basin Hookless Cactus
Argyle Canyon/ Willow Creek	1	21,070	None
	3	793	Soil and Watershed
Sunnyside and Vicinity (Northern Portion)	1	22,209	None
	3	34,600	Soil and Watershed Soil-Wetlands and Floodplains Water Resources-Springs and Water Holes Nine Mile Canyon Archaeological District Uinta Basin Hookless Cactus Visual Resources

TABLE 1-4 (concluded)

STSA	Category	Acres	Special Stipulation Areas
<u>Multiple-Use Alternative (Not Preferred)</u>			
Sunnyside and Vicinity (Southern Portion) ^a	1	16,180	None
	2	49,290	Sage Grouse Strutting Grounds Range Creek Watershed Jack Creek Watershed Nine Mile Canyon Archaeological District Roan Cliffs Elk and Deer Summer Range Deer Winter Range
	3	8,989	Sunnyside Water Supply Reserve Public Water Reserve (Riparian Area) Bear and Rock Creek Watersheds Golden Eagle Nest Parts of Sage Grouse Strutting Grounds, Jack Creek Watershed, and Nine Mile Canyon Archaeo- logical District
	4	449	Parts of Sunnyside Water Supply Reserve

^aThis portion of the Sunnyside and Vicinity STSA is within the Moab District.

TABLE 1-5
SUMMARY OF ENVIRONMENTAL CONSEQUENCES
San Rafael Swell STSA

STSA	Issues and Concerns	Resource	Maximum Development (1)	No Action (2)	Multiple Use (Preferred Alternative) (3)	Restricted Development (4)
San Rafael Swell	<p><u>Recreation & Visual Resources:</u> The STSA contains outstanding scenery and recreational opportunities. Little degradation of scenic vistas has occurred.</p> <p><u>Soils:</u> The STSA has shallow soils highly susceptible to erosion. Reclamation of disturbed areas would be impossible.</p> <p><u>Wilderness:</u> The STSA has wilderness qualities that could be destroyed with development. IMP directs management on 24 percent of the area.</p> <p><u>Minerals:</u> Uranium and vanadium deposits (mines) directly overlay tar sand deposits.</p> <p><u>Wildlife:</u> Desert bighorn sheep habitat, wild horse and burro range, and a golden eagle nest site are the major wildlife concerns.</p> <p><u>Livestock:</u> Carrying capacity for livestock is relatively low.</p> <p><u>Vegetation:</u> Five sensitive plants and one endangered plant are found within the STSA.</p>	Tar Sand	Development could occur on 115,705 acres (100 percent of the STSA), producing about 500 million barrels of in-place bitumen.	Development could occur on 76,828 acres, producing about 245 million barrels of in-place bitumen.	Development could occur on 81,414 acres, producing about 282 million barrels of in-place bitumen.	Impacts would be similar to Alternative 3 except that category 2 stipulations would limit development on 13,757 acres.
		Other Minerals	No significant impacts.	No significant impacts.	No significant impacts.	No significant impacts.
		Geology and Topography	Topographic features could be altered on 115,705 acres (100 percent of the STSA).	Topographic features could be altered on 76,828 acres (67 percent of the STSA).	Topographic features would be altered on 81,414 acres (70 percent of the STSA).	Impacts would be similar to Alternative 3 except that category 2 stipulations would limit impacts on 13,757 acres.
		Air Quality	Serious air quality problems could occur.	Similar to Alternative 1; however, the extent could differ, depending on development.	Same as Alternative 2.	Same as Alternative 2.
		Soils	Increased soil erosion could occur on 115,705 acres.	Increased soil erosion could occur on 76,828 acres.	Increased soil erosion could occur on 81,414 acres.	Impacts would be similar to Alternative 3 except that category 2 stipulations would limit impacts on 13,747 acres.
		Vegetation	Vegetation disturbance could occur on 115,705 acres.	Vegetation disturbance could occur on 76,828 acres.	Vegetation disturbance could occur on 81,414 acres.	Impacts would be similar to Alternative 3 except that category 2 stipulations would limit impacts on 13,747 acres.
		Water Resources	Water resource degradation could occur throughout all or part of STSA.	Water resource degradation could occur on 76,828 acres of the STSA.	Impacts would be similar to Alternative 2 except the San Rafael floodplain and riparian area would receive additional protection by category 2 stipulations. This area is considered a sensitive water resource.	Same as Alternative 3.
		Wildlife	Impacts to wildlife species including desert bighorn sheep, wild horses and burros, and golden eagles could occur on 115,705 acres.	Impacts to wildlife species, including wild horses and burros and golden eagles could occur on 76,828 acres.	Slight impacts would occur to desert bighorn sheep habitat. Impacts to other wildlife would not occur because riparian habitat along San Rafael River would be protected by a category 2 stipulation.	Same as Alternative 3.
		Livestock and Agriculture	Total loss of grazing AUMs and loss of springs could occur on 115,705 acres.	Total loss of grazing AUMs and loss of springs could occur on 76,828 acres.	Same as Alternative 2.	Same as Alternative 2.
		Visual Resources	Landform modification and a loss of scenic quality could occur on 115,705 acres.	Landform modification and a loss of scenic quality could occur on 76,828 acres. However, categories 3 and 4 would protect high quality scenic areas.	Landform modification and a loss of scenic quality could occur on 81,414 acres. However, categories 3 and 4 would protect high quality scenic areas.	Impacts would be similar to Alternative 3 except category 2 stipulations would limit landform modification from occurring on 13,747 acres.
		Cultural Resources	Archaeological values could be lost on 115,705 acres.	Archaeological values could be lost on 76,828 acres.	Archaeological values could be lost on 81,414 acres.	Impacts would be similar to Alternative 3 except that category 2 stipulations would limit impacts on 13,747 acres.
		Recreation	Recreational activities could be lost on 115,705 acres.	Loss of recreational activities could occur on 76,828 acres. Protected areas include: Mexican and Sid mountains, San Rafael Campground, I-70 scenic corridor, Copper Globe area, Sulfur Canyon, and Cat and Hebe canyons.	Loss of recreational activities could occur on 81,414 acres. Protected areas include Sid's and Mexican mountains, I-70 scenic corridor, and Muddy Creek. San Rafael floodplain and campground would be protected from development. Impacts could occur at the Temple Mountain base.	Impacts would be similar to Alternative 3 except that a category 2 stipulation would limit impacts on 13,747 acres in the Temple Mountain area.
		Land Use Plans	Land uses in the STSA could shift from livestock grazing and recreation to tar sand development. No conflicts exist with existing rights-of-way.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
		Socioeconomics	Housing shortages and overburdening of public facilities could occur. However, increased employment and revenue could result.	Impacts would be similar to Alternative 1 although the extent would be smaller	Impacts would be less than Alternative 1, but greater than Alternative 2.	Same as Alternative 3.

TABLE 1-5

Sunnyside and Vicinity STSA (Southern Portion)

(continued)						
STSA	Issues and Concerns	Resource	No Action/Development (1)	Multiple Use (2)	Multiple Use (Preferred) (3)	Restricted Development (4)
Sunnyside and Vicinity (Southern Portion)	<p>Watershed: The Sunnyside municipal watershed could be subject to surface disturbance if development occurred. Careful mitigation would be required to protect this resource from development.</p> <p>Underground Aquifers: Numerous seeps, springs, and mountain streams are found in the STSA and could be seriously impacted by tar sand development. Impacts to these vital water sources could affect wildlife, livestock, fisheries, and downstream water users.</p> <p>Wildlife: The STSA contains crucial summer and winter habitat for deer. In addition, the area provides crucial sage grouse habitat.</p> <p>Archaeology: The Nine Mile Canyon Archaeological District contains a heavy concentration of archaeological sites in the San Rafael Fremont area. Large-scale mining would conflict with the archaeological resources present.</p> <p>Recreation and Visual Resources: The area has outstanding scenery and is in VRM Classes II and III. The area also provides quality hunting, fishing, and sightseeing opportunities.</p> <p>Public Access: Tar sand development would conflict with access.</p> <p>Rights-of-way: Conflicts with rights-of-way could occur.</p> <p>Livestock Grazing: Loss of Federal AUMs could occur.</p> <p>Vegetation: Loss of vegetative cover necessary to protect watershed and provide livestock and wildlife forage could occur.</p> <p>Wild Horses: Loss of forage and cover could occur.</p> <p>Wilderness: Opinion varies as to extent of protection needed.</p> <p>Split Estate: In some areas of the STSA mineral ownership is Federal, while surface rights are private or State-owned. Combinations between controlling interests must be initiated before any plan of operation is approved.</p>	Tar Sand	This alternative would make approximately 4 billion barrels of in-place bitumen available for extraction.	This alternative would make about 880 million barrels of in-place bitumen available for extraction.	majority of tar sand would be available.	Because the entire STSA would be closed to surface mining, much of the tar sand deposits would be unrecoverable.
		Other Minerals	Oil shale and oil and gas loss could occur over 71,167 acres (95 percent of the STSA).	Oil shale and oil and gas loss could occur on 16,161 acres (21 percent of the STSA).	Oil shale and oil and gas loss could occur on 67,269 acres (90 percent of the STSA).	No impacts to other mineral resources would occur.
		Wilderness Values	No impacts.	No impacts.	No impacts.	No impacts.
		Air Quality	Serious air quality problems could occur.	Impacts would be similar to Alternative 1; however, the extent could differ depending on development.	Same as Alternative 2.	Same as Alternative 2.
		Geology and Topography	Topographic features could be altered on 71,167 acres.	Topographic features could be altered on 16,161 acres.	Topographic features could be altered on 67,269 acres.	Subsidence impacts related to in-situ development could occur on 49,098 acres (65 percent of the STSA). Because of category 2 special stipulations, topographic modification from in-situ development would be expected to be minor.
		Soils	Increased erosion from tar sand development could occur on 71,167 acres (95 percent of STSA).	Increased soil erosion from tar sand development could occur on 16,161 acres (21 percent of the STSA).	Increased soil erosion could occur on 67,269 acres.	Increased soil erosion could occur on slopes less than 50 percent. Because of category 2 special stipulations, soil erosion from in-situ development would be expected to be minor.
		Vegetation	Vegetation disturbance could occur on 71,167 acres.	Vegetation disturbance could occur on 16,161 acres.	Vegetation disturbance could occur on 67,269 acres.	Vegetation disturbance from in-situ development could occur on 49,098 acres. However, because of category 2 special stipulations, these impacts would be expected to be minor.
		Water Resources	Water resources degradation (surface and subsurface) could occur on 71,167 acres.	Water resource degradation (surface and subsurface) could occur on 16,161 acres.	Water resource degradation (surface and subsurface) could occur on 67,269 acres.	Water resource degradation (surface and subsurface) could occur on 49,049 acres. However, because of category 2 stipulations, water degradation would be expected to be minor.
		Wildlife	Tar sand development could destroy: 34,341 acres of crucial deer/elk summer range; 14,505 acres of crucial deer winter range; 389 acres of golden eagle nesting habitat; 2,236 acres of sage grouse strutting and nesting habitat; 3,263 acres of high quality aspen habitat; and 4,813 acres of riparian habitat. In addition, perennial streams which support fisheries could be altered and possibly lost as a result of surface mining, dewatering, or contamination. Deer and elk fawning/calving areas and migration corridors would not be protected.	Tar sand development could destroy 16,286 acres of crucial deer/elk summer range; 2,890 acres of crucial deer winter range; 3,263 acres of high quality aspen habitat, and 1,533 acres of riparian habitat. In addition, perennial streams which support fisheries could be subject to contamination and sedimentation. Deer and elk fawning/calving areas and migration corridors would not be protected.	Tar sand development could destroy: 34,331 acres of crucial deer/elk summer range; 14,505 acres of crucial deer winter range; 3,263 acres of high quality aspen habitat, 798 acres of riparian habitat, and 1,758 acres of sage grouse nesting habitat. In addition, perennial streams which support fisheries could be subject to contamination and sedimentation. Deer and elk fawning/calving areas and migration corridors would not be protected.	Tar sand development could destroy 31,384 acres of elk and deer summer range and 14,505 acres of crucial deer winter range. However, because of category 2 special stipulations, loss of these habitat types would be expected to be minor.
		Livestock and Agriculture	Tar sand development could result in the loss of suitable grazing AUMs on 71,167 acres. In addition, four springs, one corral, and 5 miles of fence could be lost and the wild horse population displaced.	Tar sand development could result in the loss of suitable grazing AUMs on 16,161 acres.	Tar sand development could result in the loss of suitable grazing AUMs on 67,269 acres. Wild horse populations would be displaced.	Tar sand development could result in the loss of suitable grazing AUMs on 49,098 acres. Most of the wild horse habitat would not be disturbed. However, because of category 2 stipulations, the loss of AUMs would be expected to be minor.
		Visual Resources	Landform modification and a loss of scenic quality could occur on 71,167 acres.	Landform modification and a loss of scenic quality could occur on 16,161 acres.	Landform modifications and a loss of scenic quality could occur on 67,269 acres.	Landform modifications and a loss of scenic quality could occur on 49,098 acres; however, because of category 2 stipulations these impacts would be expected to be minor.
		Cultural Resources	Archaeological values could be lost on 71,167 acres.	Archaeological values could be lost on 16,161 acres.	Archaeological values could be lost on 67,269 acres.	Archaeological values could be lost on 49,098 acres; however, because of category 2 stipulations, impacts would be expected to be minor.
		Recreation	Loss of recreational activities could occur on 71,167 acres.	Loss of recreational activities from tar sand development could occur on 16,161 acres.	Loss of recreational activities could occur on 67,269 acres.	Loss of recreational activities could occur on 49,098 acres; however, because of category 2 stipulations, impacts would be expected to be minor.
		Land Use Plans	Conflicts with existing rights-of-way could occur on 71,167 acres.	Conflicts with existing rights-of-way could occur on 16,161 acres in category 2 areas; however, portions of the entire STSA might not be affected.	Same as Alternative 1.	Impacts would be similar to Alternative 2, except obliteration of roads and pipelines from surface mining would not occur.
		Socioeconomics and Public Attitudes	Housing shortages and overburdening of public facilities could occur; however, increased employment and revenue could also occur.	Impacts would be less than Alternative 1.	Impacts would be less than Alternative 1 but greater than 2.	Because of category stipulations, impacts would be minor.

TABLE 1-5
White Canyon STSA

(continued)

STSA	Issues and Concerns	Resource	No Action/Maximum Development (1)	Multiple Use (Preferred Alternative) (2)	Resource Protection (3)
White Canyon	Visual Resources: The STSA is crossed by U-95 which has been designated as Utah's Bicentennial Highway. Federal agencies developed recommendations restricting development and visual intrusions along U-95. Tar sand development could conflict with these recommendations.	Tar Sand	All but 240 acres of the STSA would be open to development.	Approximately 97 percent of the STSA would be open to development; however, a special restriction would limit mining activities on 2,340 acres (29 percent of STSA).	Same as Alternative 2
	Wildlife: The STSA includes habitat for desert bighorn sheep, and impacts from tar sand development could eliminate these animals from the STSA.	Other Minerals	Uranium mining could be curtailed.	Same as Alternative 1.	Same as Alternative 1.
		Air Quality	Impacts to air quality could include fugitive dust along roads, vehicle emissions, and processing plant emissions.	Same as Alternative 1.	Same as Alternative 1.
		Geology and Topography	Topographic features from tar sand development could be altered.	Same as Alternative 1.	Same as Alternative 1.
		Soils	Soil erosion could increase on 7,805 acres.	Soil erosion could increase on 3,078 acres.	Soil erosion could increase on 1,924 acres.
		Vegetation	Vegetation disturbance could occur on 7,805 acres.	Vegetation disturbance could occur on 3,078 acres.	Vegetation disturbance would be similar to Alternative 2.
		Water Resources	Although the spring in Short Canyon would not be impacted, tar sand development could alter runoff patterns.	Same as Alternative 1.	Same as Alternative 1.
		Wildlife	Displacement and disturbance to desert bighorn sheep could occur over most of the STSA.	Mining would disrupt desert bighorn sheep movement throughout the entire STSA.	Mining would disrupt desert bighorn sheep movement in the entire STSA.
		Livestock and Agriculture	Forest production could be improved from rehabilitated tar sand development areas.	Same as Alternative 1.	Same as Alternative 1.
		Visual Resources	Tar sand development could produce a significant visual intrusion throughout most of the STSA.	Landform modification could exceed that allowable for VRM Class II and IV areas in 38 percent of the STSA.	Same as Alternative 2.
		Cultural Resources	Archaeological values could be lost on 7,805 acres.	Archaeological values on approximately 43 percent of the STSA could be lost.	Impacts to archaeological values would not occur on approximately 43 percent of the STSA.
		Recreation	The quality of sightseeing opportunities would be degraded if development occurred within the U-95 visual corridor.	All impacts to recreation would be avoided.	All impacts to recreation would be avoided.
		Land Use Plans	Impacts to future development of the Happy Jack Mine are not anticipated on non-Federal parcels. Development of adjacent Federal lands could be curtailed or foregone if tar sand development occurred.	Same as Alternative 1.	Same as Alternative 1.
		Socioeconomics	There would be no work force requirements or socioeconomic impacts.	Same as Alternative 1.	Same as Alternative 1.

TABLE 1-5
Circle Cliffs STSA

(continued)						
STSA	Issues and Concerns	Resource	No Action (1)	Maximum Development (2)	Multiple Use (Preferred Alternative) (3)	Restricted Development (4)
Circle Cliffs	Because STSA boundaries are near and in Capitol Reef National Park, concerns for watershed contamination, degradation of air quality, increased ORV use, hunting and trespass, are primary concerns.	Tar Sand	About 1 percent of the Westbank deposit (4.9 million barrels of oil) would be foregone from recovery.	All recoverable oil would be extracted.	About 1 to 2 percent of the total recoverable resource (2.2-4.4 million barrels of oil) would be foregone.	About 5.5 to 11 percent of the total recoverable resource (7-14 million barrels of oil) would be foregone.
		Other Minerals	Some uranium deposits could be destroyed from surface mining in the White Canyon Flat Area.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
	Natural and scenic qualities of the area could be destroyed by development in and near areas currently protected for recreation and scientific uses in Wolverine Petrified Wood and Escalante Canyon Outstanding Natural Areas.	Air Quality	Emissions of sulfur dioxide, nitrogen dioxide, and particulate matter would be expected to impact Capitol Reef National Park.	Emissions and particulate matter entering the Capitol Reef National Park air space would be slightly higher than Alternative 1.	Emissions and particulate matter impacting Capitol Reef National Park would be slightly less than those occurring under Alternatives 1 and 2.	Emission and particulate matter impacting Capitol Reef National Park would be less than Alternative 3.
		Soils	Soil erosion could increase on 27,300 acres.	Soil erosion could increase on 28,400 acres.	Soil erosion would be expected to increase on 26,000 acres.	Soil erosion would be expected to increase on 22,600 acres.
	Much of the Circle Cliffs area has outstanding quality scenery which could be damaged. Recreation areas, such as the Burr Trail, could lose their appeals with increased traffic.	Vegetation	Approximately 16,020 acres of vegetation having a low potential for reclamation would be destroyed.	Approximately 17,140 acres of vegetation having a low potential for reclamation would be destroyed.	Approximately 14,720 acres of vegetation, having a low potential for reclamation would be destroyed.	Approximately 13,360 acres of vegetation, having a low potential for reclamation would be destroyed.
		Water Resources	Areas draining into Capitol Reef National Park would be affected by increased sediment yields and flood damage by both in-situ and surface mining on 1,285 acres. Groundwater quality and flow could be seriously impacted from in-situ mining on 610 acres. Some alluvial aquifers would be lost from tar sand and overburden removal.	Impacts would be slightly greater than Alternative 1.	No surface mining would be allowed on areas draining into Capitol Reef National Park. However, sediment yield and flood damage from in-situ mining could occur on 610 acres. Groundwater quality and flow could be seriously impacted from in-situ mining on 610 acres.	Slightly less erosion and groundwater degradation would occur than under Alternative 3.
		Wildlife	Approximately 9 percent of the crucial deer winter range within the STSA would be lost. In addition, 1,080 acres of bighorn sheep habitat would be lost. Potential peregrine falcon (an endangered species) nesting habitat could be destroyed.	Ten percent of the crucial deer winter range within the STSA would be lost under this alternative. In addition, 1,080 acres of bighorn sheep habitat in the southeastern portion of STSA would be lost. Potential peregrine falcon (an endangered species) nesting habitat could be destroyed.		
		Livestock and Agriculture	Forage production (AUMs) on about 16,020 acres having a low potential for reclamation would be lost.	Forage production (AUMs) on 17,140 acres having a low potential for reclamation would be lost.	Forage production (AUMs) on 14,720 acres having a low potential for reclamation would be lost.	Forage production (AUMs) on 13,360 acres having a low potential for reclamation would be lost.
		Visual Resources	Contrast ratings on 360 acres of Class I, 9,497 acres of Class II, 9,873 acres of Class III, and 37,030 acres of Class IV would be exceeded. VRM Class I and II goals would be foregone permanently.	Same as Alternative 1 except contrast ratings on 1,480 acres of Class I would be exceeded.	Contrast ratings on VRM Class I areas (1,480 acres) would be exceeded. VRM Class II management goals could be obtained within 10 years.	Contrast ratings on all lands within VRM Class I areas (1,480 acres) would not be exceeded. VRM Class II and certain Class III areas would be exempt from impacts.
		Recreation	An estimated 2,500 visitor days per year would be displaced upon maximum development of tar sand resource. Lost recreational activities would occur throughout the STSA. However, the scientific and natural values associated with the Wolverine Petrified Wood Natural Area would not be impacted.	Impacts would be similar to Alternative 1 except scientific and natural values in the Wolverine Petrified Wood Natural Area would be impacted.	Impacts would be the same as Alternative 2, except that the scientific and natural values associated with Wolverine Petrified Wood Natural Area and Escalante Canyons Outstanding Natural Area would be protected.	Primary impacts would not occur where in-situ or surface mining was prohibited. Secondary impacts would occur on Burr Trail and other areas.

TABLE 1-5
Asphalt Ridge/White Rocks STSA

(continued)						
STSA	Issues and Concerns	Resource	Maximum Development (1)	No Action (2)	Multiple Use (Preferred Alternative) (3)	Restricted Development (4)
Asphalt Ridge/ White Rocks	<p><u>Wildlife:</u> Sage grouse strutting ground and nesting habitat is located within the STSA boundary. These habitats are of special concern and have high public interest. Tar sand development would conflict with this resource.</p> <p><u>Cultural Resources:</u> The STSA contains four archaeological sites with potential for nomination to the National Register of Historic Places. Tar sand development would conflict with these sites.</p>	Tar Sand and Oil and Gas	Development would be restricted on 155 acres of sage grouse strutting ground. Development within 1 1/2 miles of nesting habitat could occur only from July 1 to May 31 each year.	No restrictions to development.	Development would be restricted on 40 acres of sage grouse strutting habitat. Development on 2,328 acres of surrounding strutting grounds could occur only from July 1 to May 31 each year.	Development could not be allowed on 2,560 acres (19 percent of the STSA).
		Other Minerals	No impacts.	No impact.	No impact.	No impact.
		Geology and Topography	Topographic features could be altered on 13,014 acres.	Topographic features could be altered on 13,169 acres.	Topographic features could be altered on 13,129 acres.	Topographic features could be altered on 10,609 acres.
		Soils	Increased soil erosion could occur on 13,014 acres.	Increased soil erosion could occur on 13,169 acres.	Increased soil erosion could occur on 13,129 acres.	Soil erosion could increase on 10,609 acres.
		Vegetation	Vegetation disturbance could occur on 13,014 acres.	Vegetation disturbance could occur on 13,169 acres.	Vegetation disturbance could occur on 13,129 acres.	Vegetation disturbance could occur on 10,609 acres.
		Water Resources	Same as Alternative 2.	No impacts to surface water would be expected. Impacts to groundwater from in-situ mining would be expected where this type of development occurred.	Same as Alternative 2.	Same as Alternative 2.
		Wildlife	Sage grouse nesting habitat within 1 1/2 miles of strutting grounds could be developed. However, this development could only take place from July 1 to May 31 each year.	One hundred and fifty-five acres of sage grouse strutting grounds (1,000-ft. buffer zone included) would be destroyed. Sage grouse nesting habitat within 1 1/2 miles of strutting grounds could be developed.	Sage grouse nesting habitat on 2,328 acres surrounding strutting grounds could be developed. However, this development could only take place from July 1-May 31 each year.	No impacts to sage grouse strutting or nesting habitat would occur because of the No Surface Occupancy stipulation.
		Livestock and Agriculture	A loss of 183 Federal AUMs could occur on 13,169 acres.	Same as Alternative 1.	A loss of 182 Federal AUMs could occur.	A loss of 147 Federal AUMs could occur.
		Visual Resources	Landform modification could occur on 13,014 acres.	Landform modification could occur on 13,169 acres.	Landform modification could occur on 13,129 acres.	Landform modification could occur on 10,609 acres.
		Cultural Resources	Archaeological values could be lost on 13,014 acres.	Archaeological values could be lost on 13,169 acres.	Archaeological values could be lost on 12,929 acres.	Archaeological values could be lost on 10,609 acres.
		Recreation	Some loss of sage grouse hunting opportunities.	Loss of sage grouse hunting opportunities.	No impacts to sage grouse hunting opportunities would occur.	No impacts to sage grouse hunting opportunities would occur.
		Land Use Plans	Conflicts with existing rights-of-way for roads, pipelines, and communication sites on 13,014 acres could occur.	Conflicts with existing rights-of-way for roads, pipelines, and communication sites on 13,169 acres could occur.	Conflicts with existing rights-of-way for roads, pipelines, and communication sites on 13,129 acres could occur.	Conflicts with existing rights-of-way for roads, pipelines, and communication sites on 10,609 acres could occur.
		Socioeconomics	Housing shortages and overburdening of public facilities and services could occur. However, possible increases in employment and tax revenue could also occur.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

TABLE 1-5
Pariette STSA

(continued)

STSA	Issues and Concerns	Resource	Maximum Development (1)	No Action (2)	Multiple Use (3)	Restricted Development (4)
Pariette	<p><u>Watershed:</u> The STSA contains public lands defined as wetlands and floodplains and waterfowl habitat. In addition, Federal lands containing important live water are also within the STSA. Water is scarce and full tar sand development could interrupt water flow.</p> <p><u>Wildlife:</u> Golden eagle roost sites as well as bald and golden eagle concentration areas are found within the STSA. These areas could require special protection if oil and gas or tar sand development occurred. In addition, the area includes a portion of the Pariette Waterfowl Management Area.</p>	Tar Sand	Open leasing would provide for maximum development of oil and gas and tar sand resources.	The stipulation for wetlands would restrict surface intensive development such as surface mining, although the potential for this type of development is low.	Protection of renewable resources would not unreasonably interfere with development.	This alternative could eliminate recovery of tar sand.
		Other Minerals	No impacts.	No impacts.	No impacts.	No impacts.
		Water Resources	Tar sand development could result in surface disturbance and contamination of surface and groundwater. Wetlands and floodplains could also be damaged.	Special stipulations would protect wetlands, floodplains, and waterfowl habitat.	Similar to Alternative 2 except an additional 40 acres would be protected.	This alternative would provide the maximum amount of protection to wetlands and floodplains through a no surface occupancy stipulation.
		Wildlife	Tar sand development could result in disturbance or displacement (loss of roosting and/or prey habitat) of wintering bald and golden eagles. In addition, destruction of waterfowl brooding and nesting habitat would occur.	Same as Alternative 1 except that a stipulation would protect waterfowl habitat.	Special stipulations would preclude impacts from tar sand development.	No impacts to wildlife would occur.
		Vegetation	Surface-disturbing activities would require the removal of vegetation and topsoil. Construction activities could destroy existing populations and potential habitat for the threatened Uinta Basin hookless cactus.	Same as Alternative 1.	If the Uinta Basin hookless cactus were found on any site proposed for disturbance, the site could be moved or the plant populations relocated.	This alternative would preclude adverse impacts to threatened and endangered plants and their potential habitats.
		Socioeconomics	In many cases, public facilities could not accommodate the expected population increases resulting from tar sand development.	Same as Alternative 1.	Same as Alternative 1.	Because of leasing restrictions, impacts would be significantly less than Alternatives 1, 2, or 3.

TABLE 1-5
Argyle Canyon/Willow Creek STSA

(continued)

STSA	Issues and Concerns	Resource	No Action/Development (1)	Multiple Use (Preferred Alternative) (2)	Restricted Development (4)
Argyle Canyon/ Willow Creek	<u>Wildlife</u> : The STSA contains crucial summer habitat for elk and mule deer as well as sage grouse habitat.	Tar Sand and Oil and Gas	Development could occur on 12,877 acres, with an estimated production of 3 to 5 million barrels of oil.	No development on slopes greater than 40 percent could occur without written permission from the authorized officer.	No mineral development would occur.
	<u>Water Resources</u> : The STSA contains wetlands and floodplains protected by Executive Orders.	Other Minerals	No restrictions would be placed on mining activity.	No impact to other minerals.	No mineral development would occur.
	<u>Soils</u> : Soils within the STSA have a high erosion hazard and require special protective measures.	Geology and Topography	Topographic features could be altered on 12,877 acres.	Topographic features on slopes greater than 40 percent would not be altered unless written permission for development was obtained.	No impacts.
		Soils	Soil erosion could increase on 12,877 acres.	Increased soil erosion on slopes less than 40 percent could occur. In addition, soil erosion could increase on slopes greater than 40 percent if written authorization for development were obtained.	No impacts.
		Vegetation	Vegetation disturbance could occur on 12,877 acres having a low potential for reclamation.	Vegetation disturbance on slopes less than 40 percent could occur. In addition, vegetation disturbance could occur on slopes greater than 40 percent if written authorization for development were obtained.	No impacts.
		Water Resources	Approximately 1,036 acres of wetlands/floodplains would be destroyed.	No impacts.	No impacts.
		Wildlife	Approximately 12,193 acres of mule deer and elk crucial summer range could be destroyed.	Development could only occur between July 1-May 31 of each year on crucial summer range for elk and deer. Areas with less than 40-percent slope could be destroyed from development. In addition, crucial summer range for elk and deer on areas greater than 40-percent slope could be destroyed if written authorization for development of these areas were obtained.	No impacts.
		Livestock	All AUMs on suitable livestock grazing areas could be lost.	All Federal AUMs on suitable livestock grazing areas with slopes less than 40-percent could be lost.	No impacts.
		Visual Resources	Landform modification and a loss of scenic quality could occur on 12,877 acres.	Landform modification and a loss of scenic quality could occur on slopes less than 40 percent. In addition, scenic quality of areas with slopes greater than 40 percent could be impaired if written authorization to develop these areas were obtained.	No impacts.
		Cultural Resources	Archaeological values on 12,877 acres could be destroyed.	Archaeological values on slopes less than 40 percent could be destroyed. In addition, archaeological values on slopes greater than 40 percent could be destroyed if written authorization to develop these areas were obtained.	No impacts.
		Recreation	Hunting, sightseeing, and ORV activities could be lost on 12,877 acres.	There could be some loss of hunting, sightseeing, and ORV opportunities.	No impacts to hunting, sightseeing, or ORV activities would occur.
		Land Use Plans	Conflicts with existing rights-of-way could occur on 12,877 acres.	Conflicts with existing rights-of-way could occur on slopes less than 40 percent. In addition, conflicts with existing rights-of-way could occur on slopes greater than 40 percent if written authorization to develop these areas were obtained.	No conflicts with existing land use plans would occur.

TABLE 1-5
Sunnyside STSA (Northern Portion)

Sunnyside STSA (Northern Portion)					
(continued)	Issues and Concerns	Resource	No Action/Development (1)	Multiple Use (Preferred Alternative) (2)	Restricted Development (3)
Sunnyside (Northern Portion)	Soils: There are soils within the STSA having a high erosion hazard which require special protection.	Tar Sand	This alternative would allow for maximum exploration and development on 33,072 acres.	This alternative would provide the least restrictive stipulations, while protecting the environment and still allowing for the optimum amount of tar sand development.	Only 29 percent of the STSA would be open for leasing and development.
	Water Resources: The STSA contains wetlands, floodplains, and springs requiring special protection.	Other Minerals	No impacts.	No impacts.	No impacts.
	Archaeology: The STSA encompasses the Nine Mile Canyon Archaeological District, which is nominated to the National Register of Historic Places.	Geology and Topography	Topographic features could be altered. The amount of alteration would depend on the location and amount of development.	Topographic features would not be altered on 16,200 acres.	Topographic features would not be altered on 23,412 acres.
	Threatened and Endangered Species: The Uinta Basin hookless cactus occurs in the northern portion of the STSA.	Soils	Accelerated erosion and off-site soil and water degradation could occur on areas where surface disturbance was extensive and where unstable soil conditions exist.		The soil resource would be given maximum protection from accelerated erosion resulting from development.
	Recreation and VRM: The Nine Mile Canyon area of the STSA contains outstanding scenery and has been rated as a VRM Class II area.	Vegetation	Extensive tar sand development could destroy existing populations and habitat of the threatened Uinta Basin hookless cactus.	If the Uinta Basin hookless cactus were found, the development location could be moved or the plant population relocated.	This alternative would preclude adverse impacts to threatened plants and their habitat.
		Water Resources	Degradation of wetlands, floodplains, and springs could occur in Argyle Canyon and along Nine Mile Creek.	Special stipulations would not allow disturbance within 600 feet of wetlands, floodplains, or springs. However, these stipulations might not adequately protect recharge areas.	A no surface occupancy stipulation would provide the maximum amount of protection to wetlands, floodplains, and springs in Argyle Canyon and along Nine Mile Creek. However, these stipulations might not protect recharge areas.
		Wildlife	Loss of mule deer and raptor habitat could occur.	Same as Alternative 1. However, development would be precluded on 15,120 acres on slopes in excess of 40 percent and on 2,000 acres where surface occupancy would not be allowed within 600 feet of water.	A no surface occupancy stipulation for 23,412 acres would significantly reduce impacts to wildlife.
		Livestock and Agriculture	Depending upon the amount of development, six or eight allotments be significantly affected by tar sand development, with reductions of more than 10 percent.	Impacts could occur on 9,660 acres of category 1 areas and 17,952 acres of category 2 areas.	Surface occupancy would be precluded on 23,412 acres. This would significantly reduce impacts to livestock operations.
		Visual Resource Management	VRM Class II objectives would not be achieved.	VRM Class II objectives could be met in category 2 areas.	VRM Class II objectives could be achieved.
		Cultural Resources	Large-scale development would destroy the archaeological values in Nine Mile Canyon.	Same as Alternative 1, except that potential lessees would be told that Nine Mile Canyon is a sensitive archaeological area and more specific protective stipulations would be imposed prior to leasing.	Special stipulations would protect all lands characterized as potentially valuable for cultural resources.
		Recreation	Loss of recreational activities (hunting, ORV, sightseeing) could occur throughout the STSA.	Impacts to recreation would be less severe than Alternative 1 because of category 2 stipulations.	Same as Alternative 2.
		Land Use Plans	Existing pipeline rights-of-way and public roads could be severely impacted from tar sand development.	This alternative would have similar, but slightly less, impacts than Alternative 1.	Impacts would be substantially less than Alternatives 1 and 2.
		Socioeconomics	Public facilities could not accommodate expected increases in populations in Carbon or Duchesne Counties.	Same as Alternative 1.	Because of the smaller work force required for construction and operation, socioeconomic impacts would not be as severe as Alternatives 1 and 2.

CHAPTER 2

ALTERNATIVE EVALUATIONS

INTRODUCTION

This chapter describes each Special Tar Sand Area (STSA) and identifies major issues and environmental consequences for development of tar sand resources at varying levels. This description is organized by Bureau of Land Management (BLM) District: Moab District STSAs will be discussed first, followed by Cedar City and, finally, Vernal.

To aid in locating each District's STSA, this chapter has been printed on colored paper: Moab District appears on yellow, Cedar City on green, and Vernal on blue. Also running heads for each STSA appear on the right hand side of each page.

Wilderness, threatened and endangered plants and animals, and archaeological resources require special protective measures, regardless of category designations. Therefore, stipulations for these resources are discussed below and will not be repeated in each STSA discussion.

Wilderness

Wilderness Study Areas (WSAs) and appealed inventory units are managed under the Interim Management Policy (IMP), which provides special protection to these areas, regardless of leasing categories. Wilderness values were not considered in development of leasing categories; however, category designations considered other resource values and multiple uses.

A wilderness stipulation is attached to each oil and gas

lease issued after October 21, 1976 in IMP areas (U.S. Department of Interior [USDI], BLM, 1979a) and, by extension, will be attached to Combined Hydrocarbon Leases (CHLs) (tar sand conversions or new leases). This stipulation lists required measures ensuring nonimpairment of wilderness values. If any WSA were designated wilderness by Congress, it would be managed under BLM's *Wilderness Management Policy* and new leasing would not be allowed.

Threatened and Endangered Species

A literature search and an on-the-ground survey for threatened, endangered, and sensitive species will be conducted on tar sand tracts prior to leasing by BLM. Should BLM determine that leasing and resultant tar sand development might have an effect on listed species, formal consultation with the Fish and Wildlife Service (FWS) will be initiated.

Archaeological Resources

Prior to entry upon the land or surface disturbance for mining, drilling, or other purposes, the lessee shall be required to submit for approval an Application for Permit to Drill (APD), exploration plan, or plan of operation which shall describe the methods and actions proposed for cultural resource protection and clearance. This will be in accordance with Section 36 of the Code of Federal Regulations (CFR) 800 and BLM Manual 8100 (Cultural Resource Management).

MOAB DISTRICT

San Rafael Swell STSA

MAJOR ISSUES

The San Rafael Swell STSA is located entirely within the San Rafael Swell. This is a large geologic uplift encompassing major portions of Emery, Sevier, and Wayne counties in eastern Utah. The area is arid to semi-arid with pinyon-juniper forests on mesa tops. Major issues for tar sand development in this STSA are:

- **Recreation and Visual Resources:** The San Rafael Swell, including the STSA, has long been recognized for its outstanding scenery and recreational qualities. It is noted for its outstanding geologic scenery, consisting of huge sawtooth ridges of massive sandstone, table buttes and pinnacles, and steep, colorful canyons. Over 600,000 travelers view this area each year along Interstate Highway 70 (I-70). The Utah Department of Transportation (UDOT) has constructed seven overlooks and viewing areas throughout and overlooking the STSA. If large-scale surface mining occurred, surface disturbance would be visible in certain areas. Conflicts with recreationists involved in dispersed activities (i.e., sightseers, backpackers, and campers) and river users along the San Rafael River would probably occur with large-scale mining.
- **Watershed:** Much of the STSA consists of near-vertical rock faces, cliffs, or sandstone ridges. Complete reclamation of such areas would not be possible if the area were disturbed by road construction, drilling pads, and/or mining. The entire area is arid to semi-arid, with shallow soils in many areas. Erosion control and reclamation would be difficult.
- **Wilderness:** Of the 115,705 acres administered by BLM, IMP status would apply to approximately 24 percent (28,232 acres) of the STSA. All new or converted CHLs would be under the strictest nonimpairment criteria. Because of the area's poor reclamation potential, nonimpairment criteria probably could not be met in tar sand development areas; therefore, these areas would have to be excluded from exploration and mining activities until Congress makes a final wilderness decision.
- **Uranium:** Nineteen uranium and vanadium mines and 16 prospects are located in the STSA. These minerals lie in formations directly over the tar sand. Surface mining or in-situ extraction could either destroy or directly affect these overlying formations.
- **Wildlife:** Loss of wildlife habitat and disturbance.
- **Livestock:** Loss of grazing use.
- **Vegetation:** Loss of vegetative cover.

ALTERNATIVES

Alternative 1, Development

This alternative would maximize tar sand development throughout the STSA. All BLM areas in the STSA (115,705 acres) would be designated category 1, open to leasing with standard surface-disturbing stipulations (see Figure 2-1).

Alternative 2, No Action

BLM would take no new action and would maintain the existing oil and gas categories (USDI, BLM, 1975 and 1979b). All CHLs and conversions would conform to present stipulations and restrictions.

Existing categories are illustrated in Figure 2-2. Category 2 (leasing with special stipulations) would not be used in this alternative. The following lists the approximate acres and percent of STSA in the various categories. (Unless otherwise specified, all percentages in this environmental impact statement [EIS] are based on total BLM acreages, exclusive of any State of Utah or private inholdings in the STSA.)

Category	Acres	Percent
1	76,842	67
3	21,047	18
4	17,816	15

The principal values protected by categories 3 and 4 under this alternative would be outstanding scenery, fragile watershed, bighorn sheep habitat, and a major scenic corridor along I-70.

Alternative 3, Multiple Use (Preferred Alternative)

This alternative uses all four categories to protect special resource values while allowing tar sand development. All new leasing and conversions would conform to the categories shown in Figure 2-3. The following table lists the approximate acres and percent of the STSA in the various categories:

Category	Acres	Percent
1	81,414	70
2	6,663	6
3	8,861	8
4	18,767	16

The following narrative describes specific areas within the STSA. Each area is shown in Figure 2-3.

No. 15, San Rafael Campground (Category 3, 240 Acres). The San Rafael Campground, located in the extreme northern portion of the STSA, was recommended for category 3 to preserve the recreational values of the campground.

No. 32, Mexican Mountain (Category 3, 791 Acres; Category 4, 9,652 Acres). The Mexican Mountain area, located in the northeastern portion of the STSA, was recommended for a combination of categories 3 and 4 to protect high quality scenic areas. This area is part of the San Rafael Reef and contains steep cliffs and canyons. Complete rehabilitation of roads, well pads, and mined areas would not be possible in this extreme topography. The area is highly scenic, and portions can be viewed from I-70.

No. 33, Sid's Mountain (Category 3, 1,441 Acres; Category 4, 160 Acres). The Sid's Mountain area is similar to Mexican Mountain in topography and extreme relief and is also part of the San Rafael Swell. The area is largely roadless and primitive. This area has been the general site for desert bighorn sheep transplants by the Utah Division of Wildlife

SAN RAFAEL SWELL STSA

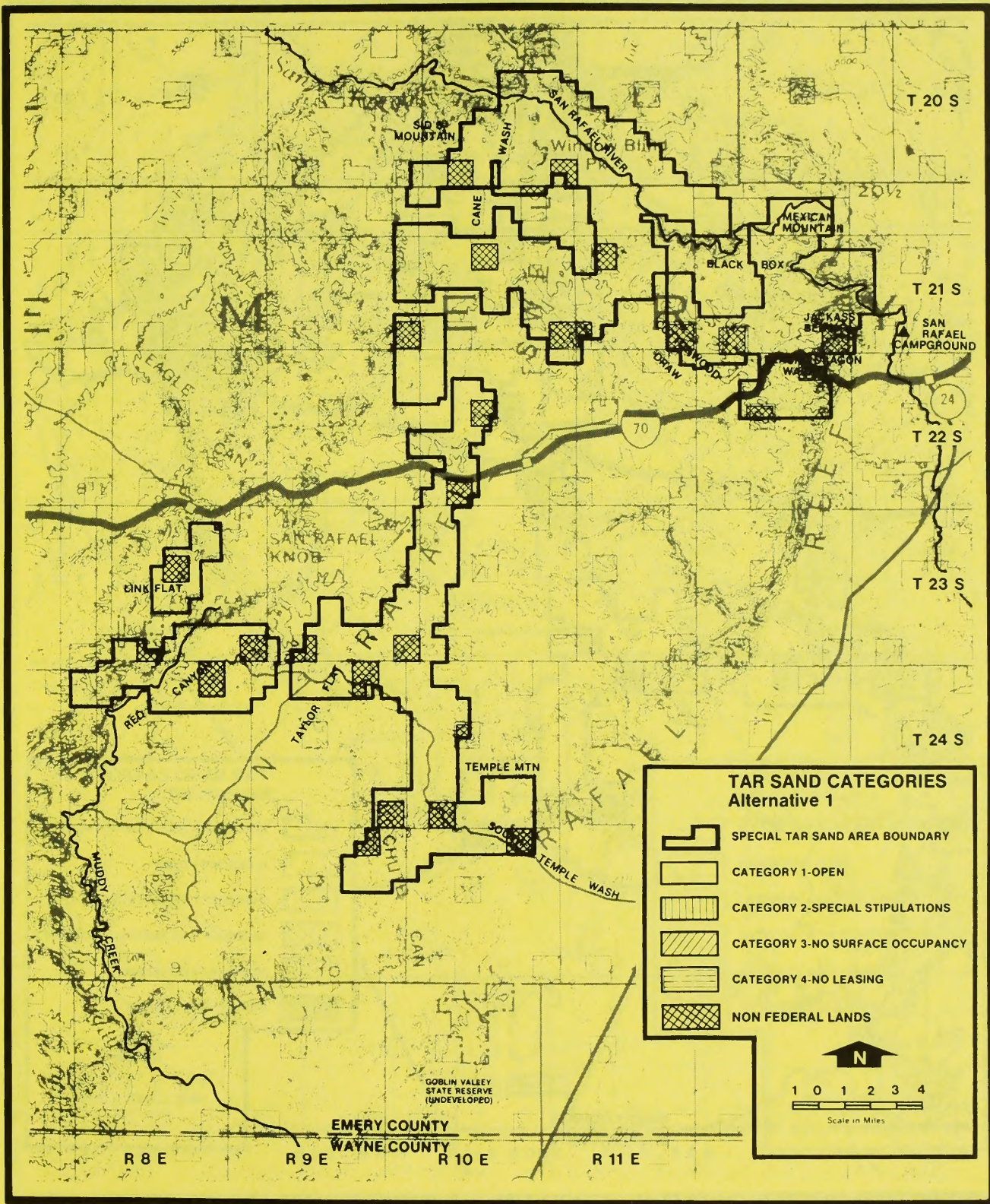


FIGURE 2-1
ALTERNATIVE 1, SAN RAFAEL SWELL STSA

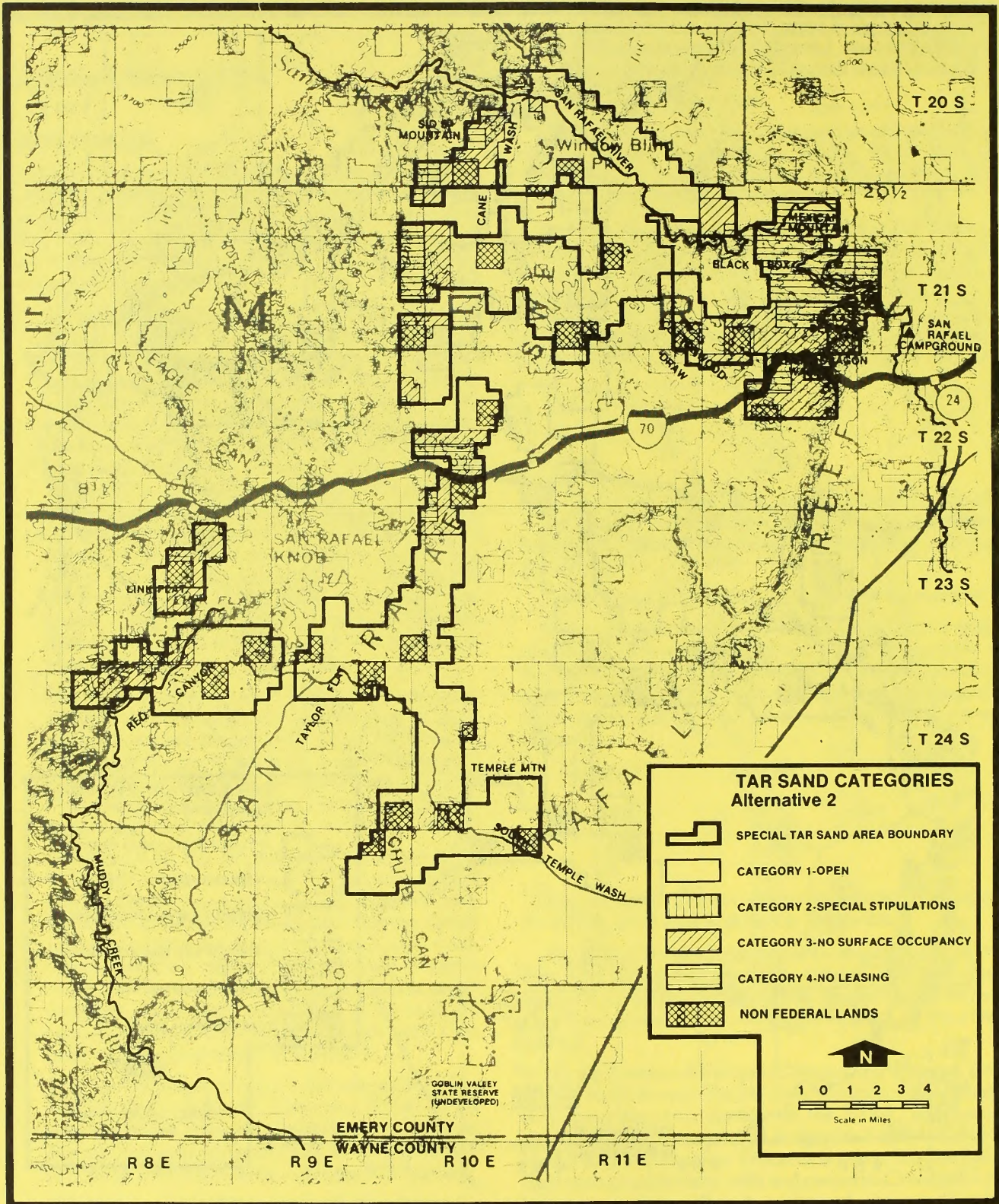


FIGURE 2-2
ALTERNATIVE 2, SAN RAFAEL SWELL STSA

[illegible]

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CHAP 2: ALTERNATIVE EVALUATIONS

Resources (UDWR), and development would not be compatible with bighorn sheep use. Reclamation would be extremely difficult or impossible because of the rugged topography. Therefore, a combination of categories 3 and 4 was recommended to protect these special resource values.

No. 35, San Rafael River (Category 2, 3,720 Acres). This major floodplain requires protection as required by Executive Order 11988 and various Departmental and BLM manuals. The only practical means to prevent disturbance in this floodplain and to eliminate flooding hazards to oil, gas, and tar sand facilities is to create a 0.25-mile buffer zone from the stream channel centerline.

Stipulation:

- No occupancy or other surface disturbance will be allowed within 0.25 mile of the channel centerline. This distance may be modified when specifically approved in writing by BLM.

No. 36, Muddy Creek (Category 2, 2,943 Acres; Category 3, 1,036 Acres; Category 4, 474 Acres). The Muddy Creek area is located in the extreme southwestern portion of the STSA. This area, which lies only partly within the STSA, forms the heart of the San Rafael Swell. It is composed of mesas, ledges, and colorful canyons. Broad, grassy areas are also present, encircled by sandstone escarpments. The area also contains range for a herd of wild horses. It would be difficult to reclaim because of steep slopes, rock outcrops, and arid climate.

A combination of categories 2, 3, and 4 was recommended. The portions incapable of successful rehabilitation were placed in categories 3 and 4, and the remaining area was placed in category 2 to protect sensitive resources.

Stipulation (category 2 areas only):

- No surface mining of tar sand deposits is allowed on this lease. The tar sands may be extracted by in-situ methods only.

No. 38, I-70 Scenic Corridor (Category 3, 5,273 Acres; Category 4, 8,481 Acres). The I-70 scenic corridor was recommended for a combination of categories 3 and 4. Prior to completion of I-70 across the San Rafael Swell in 1976, this area was accessible only by unimproved dirt roads and was not visited extensively by the public. However, upon completion of I-70 in 1980, over 600,000 people viewed the spectacular scenery across the San Rafael Swell.

In building this section of I-70, the UDOT, in recognition of the high scenic values present, constructed seven scenic overlooks. While none of these overlooks fall within the STSA, they provide views of Mexican Mountain, Sid's Mountain, and Ghost Rock (near Devil's Canyon). Cultural sites also occur within the I-70 corridor. The natural, unintruded appearance of this area is also one of its most outstanding features.

No. 45, South Temple Wash Material Site (Category 3, 80 Acres). The South Temple Wash material site issued to Emery County was recommended for category 3 to protect its integrity for county use.

Alternative 4, Restricted Development

This alternative would provide for the maximum protection of significant resource values. The following table lists

the approximate acres and percent recommended for the various categories for this alternative.

Category	Acres	Percent
1	67,657	58
2	20,420	18
3	8,861	8
4	18,767	16

This alternative is identical to Alternative 3, with the addition of one additional protected area (see Figure 2-4).

No. 46, Temple Mountain/Goblin Valley Recreation Management Area (RMA) (Category 2, 13,757 Acres). The Temple Mountain/Goblin Valley RMA lies in the southern portion of the STSA. A RMA designation was previously proposed because of the area's high scenic quality and recreational use associated with the Goblin Valley State Park.

A category 2 designation was recommended for the area, with the following stipulation:

Stipulation:

- No access or work trail or road, earth cut or fill, structure or other improvement, or mine area will be permitted if it can be viewed from the Temple Mountain county road or Goblin Valley State Park.

AFFECTED ENVIRONMENT

Air Quality and Climate

The STSA is in a Class II air quality classification, as determined by the 1977 Clean Air Act Amendment. This class allows for moderate increases in air pollution levels. The only source of air pollution in the STSA is I-70, which is a linear source of vehicle emissions. The Emery Power Plant near Castle Dale and the Huntington Canyon Power Plant near Huntington, located about 20 miles northeast of the STSA, are point sources for emissions. The Town of Green River, located about 15 miles east of the STSA, also provides a source for air pollution, primarily from domestic wood-burning stoves and open burning at the municipal dump.

The climate is arid to semi-arid. Average annual precipitation is 8 to 12 inches throughout most of the STSA, with less than 8 inches occurring at elevations less than 5,000 feet and more than 12 inches occurring at elevations greater than 6,800 feet. The mean annual air temperature is about 47 to 54 degrees Fahrenheit (F), and the average frost-free season ranges from 90 to 140 days.

Geology and Topography

The STSA is located in the eastern half of the San Rafael Swell, which is a breached, double-plunging anticline located on the northwestern edge of the Colorado Plateau. The western part of the STSA is known as Sinbad Country and contains benches, mesas, knolls, buttes, cliffs, and canyons. The eastern part of the STSA includes part of the San Rafael Reef, a monocline that forms the east side of the Swell. The Reef forms a jagged, sawtooth ridge. Elevations range from about 4,500 feet to more than 7,000 feet. The San Rafael River has cut a deep canyon and flows through the northeastern part of the STSA.

Tar sand within the STSA occurs in the Moenkopi for-

[illegible]

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mation. The Black Dragon, which is the basal member, contains nearly all of the bitumen. The rocks in the center of the Swell dip at 0 to 3 degrees. This dip increases to the east, with the rocks of the Reef dipping from 20 to more than 45 degrees. To the west of the Reef, the dips increase gradually to 5-7 degrees.

The oldest exposed rock unit in the STSA is the Cocoino sandstone, which lies beneath the Moenkopi. The youngest exposed formation is the Carmel, which occurs in the western part of the STSA. The geologic formations above the Moenkopi formation include, in ascending order, Chinle formation, Wingate sandstone, Kayenta formation, Navajo sandstone, and Carmel formation.

The Moenkopi formation (250 to 850 feet thick) is composed of red and buff sandstone and greenish-gray and red siltstone and mudstone. The basal unit is the Black Dragon member, which consists of fine-grained, micaceous, cross-stratified sandstone and very thin-bedded sandstone, siltstone, and mudstone. The sandstones contain the tar sand.

The Black Dragon member is overlain by the Sinbad limestone, a light-gray marine limestone. The Sinbad is overlain by the Torrey member, which is comprised of interbedded siltstone, dolomite, and very fine-grained sandstone at the base, which grades upward into ledge-forming, very fine-grained sandstone (Blakey, 1977).

Minerals

TAR SAND: The tar sand resource in the San Rafael Swell occurs in the Black Dragon member of the Moenkopi formation. The Sinbad, Torrey, and Timpoweap members contain minor occurrences of tar sand. Tar content of the Black Dragon member ranges from 2 to 17 percent (see Table 2-1).

The Black Dragon member is estimated to contain 15 million barrels of oil (in place) per square mile (10 percent tar at 10 meters thick) in the Cottonwood Draw area. The extent and exact location of the tar sand deposits are unknown. Estimates are based on limited core data and outcrop locations. Figure 2-5 shows approximate and known locations of tar sand deposits in the San Rafael Swell STSA. The following table lists the areas of known deposits and estimated reserves.

<u>Deposit</u>	<u>Reserves (In Place)</u>
Chute Canyon	50 million barrels
Cottonwood Draw	75 million barrels
Wickiup	60 million barrels
Family Butte	100 million barrels
Black Dragon	100 million barrels

Source: Campbell, 1977.

OTHER MINERAL RESOURCES: The tar sand deposits of the STSA are found in the Torrey and Black Dragon members of the Moenkopi formation, which underlie the Chinle formation. The Chinle formation contains most of the uranium found in the Swell. Most uranium deposits are small; however, some have had substantial production. The Temple Mountain District, located in the extreme southern portion of the STSA, produced 261,000 tons of ore between 1948 and 1956. This ore contained 1,287,000 lbs. of uranium oxide (U_3O_8) and 3,799,000 lbs. of vanadium oxide (V_2O_5).

The Lucky Strike Mine, located in the southwestern part of the STSA (Township 24 South, Range 9 East, Section [Sec.] 5), produced over 10,000 tons of ore containing approximately 2,200 lbs. of U_3O_8 and approximately 900 lbs. of V_2O_5 between 1948 and 1956. Seventeen other small underground mines and prospects occur in the STSA, mostly around the edges of Chinle outcrops.

The Copper Globe Mine, located in the western part of the STSA (Township 23 South, Range 9 East, Sec. 21), contains copper minerals in the Navajo sandstone. The mine is worked chiefly for mineral specimens and minerals used for jewelry. Copper has also occurred in association with uranium in the Temple Mountain District and along the western side of the San Rafael Swell (west of the STSA). Other than at the Copper Globe Mine, no copper is now produced in the San Rafael Swell.

Manganese and bedded potash occur in the STSA but are not considered feasible for development.

Soils

The soils in the STSA have developed in alluvium, residuum, and eolian material derived from parent sandstones and shales. These sandstones and shales vary significantly in their weathering characteristics and content of salts. Rock outcrop, badland, and gypsum lands are commonly encountered in or near the San Rafael Swell.

Soils on mesas, structural benches, and cuestas comprise much of the Swell; these soils are generally shallow. Deep soils are primarily limited to valley fill. Soils in canyons are generally moderately deep to very deep on alluvial fans below canyon escarpments and shallow on benches and ledges on canyon walls. Soils on canyon floors and along washes are generally very deep.

Soil textures and rock fragment and salt contents vary considerably over the tracts. Generally, soils on structural benches, mesas, and cuestas are loamy. Shallow soils generally occur on sloping to steep benches, and very deep soils occur in concave slope positions. Sandy soils are common, particularly near ridgelines. Clayey soils occur near or on shale outcrops and where alluvium from shaly material has accumulated. Soils on fans in canyons are generally loamy and commonly are very or extremely stony and bouldery. Shallow soils on benches and ledges on the canyon walls are loamy or clayey, depending on the source of the parent material. Soils on canyon floors and along washes are highly variable as to texture and rock fragment and salt content.

Generally, soils near washes and on the lower slopes of alluvial fans have accumulated soluble salts in some part of their profile. Loamy and clayey soils developing in material derived from shale generally have high contents of soluble salts or mantle material high in soluble salts. Badland and gypsum lands are commonly natural sources of salts and sediments carried into local washes.

The area is highly susceptible to soil erosion once the existing vegetation is removed. Erosion losses from water erosion can be expected to be higher in areas containing shales or materials high in salts and on steep slopes.

Vegetation

The vegetation of the STSA consists of three general

TABLE 2-1

Tar Sand Analysis of the
San Rafael Swell STSA

UGMS ^a Sample Number	Deposit	Member of Moenkopi Formation	Percent of Tar	Percent of Carbon	Percent of H ¹ ^b	Percent of S ^c	Specific Gravity g/cc ^d	Gravity API ^e
70-6A	Jackass Bench	Black Dragon	8.6	66.85	10.36	3.47		
70-8A	Black Dragon	Black Dragon	7.9	69.42	10.72	5.08	1.0389	4.7
70-11A	Cottonwood Draw	Black Dragon	5.0	68.85	11.60	1.64		
70-12A	Black Dragon	Black Dragon	16.8	70.17	11.25	4.13	1.0138	8.1
70-13A	Black Dragon	Black Dragon	4.5	67.36	10.41	2.84	0.9972	10.4
70-15A	Cottonwood Draw	Black Dragon	2.7	68.05	10.95	3.22		
70-16A	Black Dragon	Black Dragon	2.4	70.17	11.22	3.58		
70-9A	Family Butte	Torrey	11.0	68.15	11.40	3.46	0.9603	15.8
70-10A	Family Butte	Torrey	8.1	69.32	10.80	3.65		
70-14A	Red Canyon	Torrey	3.9	72.36	11.81	2.57		

Source: Blakey, 1977.

^aUGMS = Utah Geological and Mineral Survey^bH¹ = hydrogen^cS = sulfur^dg/cc = grams per cubic centimeter^eAPI = American Petroleum Institute

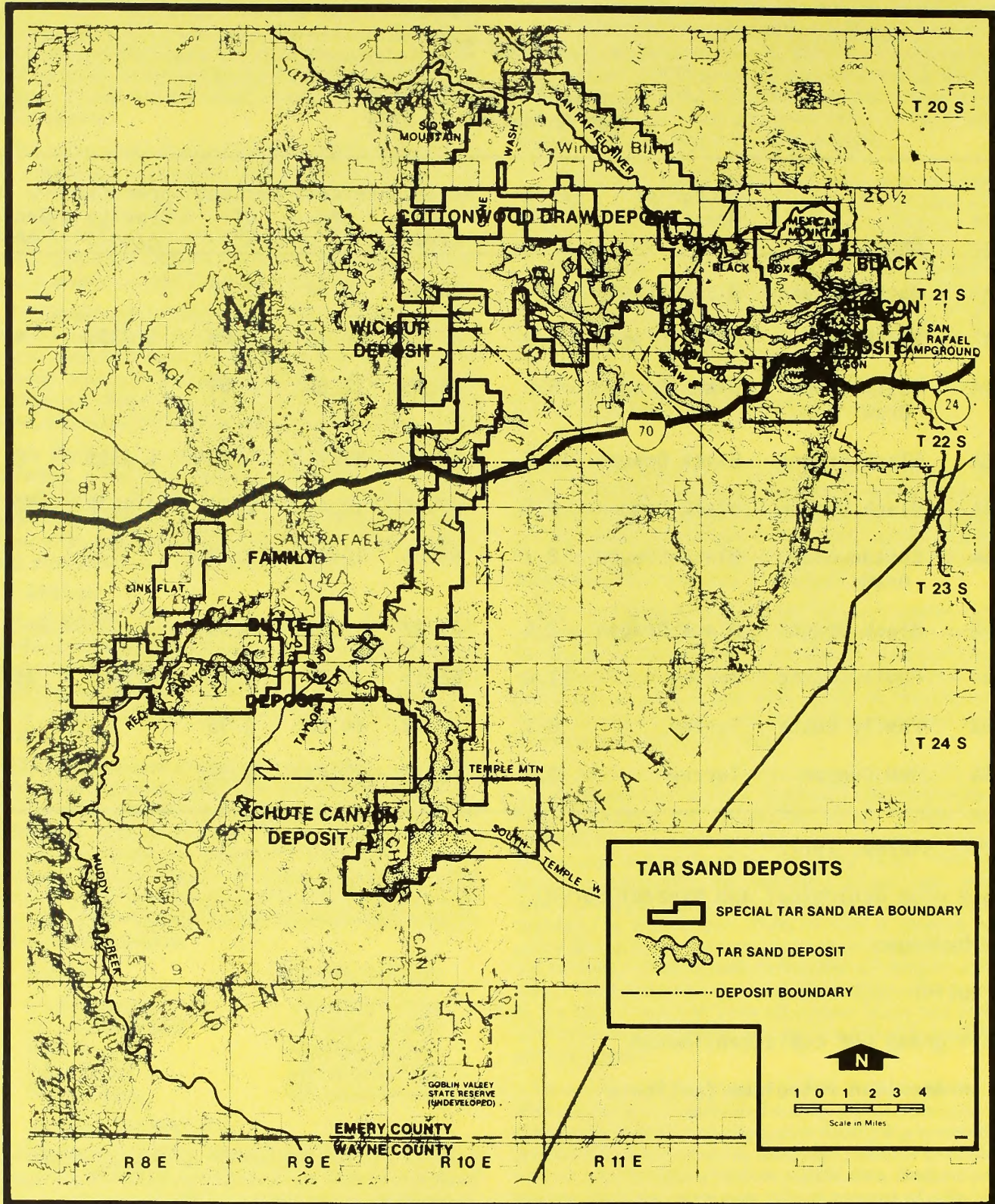


FIGURE 2-5
TAR SAND DEPOSITS IN SAN RAFAEL SWELL STSA

SAN RAFAEL SWELL STSA

types: pinyon-juniper, grassland-desert shrub, and riparian. These are all xeric vegetative types produced in an 8- to 12-inch rainfall zone. The riparian area, occurring along the San Rafael River, consists of a narrow band of salt grass and tamarisk.

The following plants found within the STSA are Federally listed as endangered or sensitive:

<u>Species</u>	<u>Status</u>
<i>Astragalus refaelensis</i>	Sensitive
<i>Cryptantha jonesiana</i>	Sensitive
<i>Cryptantha jonstonii</i>	Sensitive
<i>Gaillardia flava</i>	Sensitive
<i>Psoralea polyadenia</i> var. <i>jonesii</i>	Sensitive
<i>Sclerocactus wrightiae</i>	Endangered

The locations of these plants are poorly defined, which makes category assignment difficult.

RECLAMATION POTENTIAL. Reclamation would be dependent upon several factors: (1) depth and type of topsoil available for reclamation purposes; (2) precipitation; (3) slope; and (4) type of disturbance. Reestablishment of vegetation would be possible within 4 years of disturbance in areas receiving 10 inches of rainfall, primarily the pinyon-juniper and grassland communities, and where adequate topsoil was saved for reclamation. This would be limited to less than 50 percent of the STSA and to areas subject to in-situ development.

Water Resources

The San Rafael River flows through the northern part of the area. Muddy Creek does not flow through the STSA, although its tributaries drain through the southern portion. Muddy Creek and San Rafael River contribute to the salt and sediment load of the Colorado River. Cane Wash contains several springs which are important water sources for livestock and wildlife. Another important water source is the Sinbad Well, which is also in Public Water Withdrawal Reservation 107 (U-41603). This well is also located in an area with high erosion potential. There are several other water sources scattered throughout the area including springs, ponds, and reservoirs.

There are no known aquifers of significance within the STSA. All groundwater is perched (see Glossary). Lack of water is a dominant characteristic of the San Rafael STSA. Infrequent occurrence makes water a primary limiting factor for wildlife, livestock, and vegetation, and even a small spring is important.

Wildlife

The principal wildlife concerns in the San Rafael STSA are desert bighorn sheep habitat and golden eagle nesting sites. Any activities within a 1- to 2-mile radius of a nest could cause nest abandonment. Most of the STSA is historical bighorn sheep habitat. The Sid's Mountain area contains a small population of bighorn sheep, which is adjacent to a desert bighorn transplant site made in 1981-82 by UDWR. The Mexican Mountain area is also historic habitat for bighorn sheep.

Riparian areas associated with the San Rafael River and isolated springs also provide high value wildlife habitat (e.g., passerine birds, etc.) in the STSA. The highest density and diversity of wildlife species are found near riparian areas.

The San Rafael River area is also historic habitat for the endangered peregrine falcon.

Livestock and Agriculture

There are no agricultural lands within the STSA. Carrying capacity ranges from 11 acres per animal unit month (AUM) to 48 acres per AUM. Cattle, sheep, and a few saddle horses graze the area from late fall through spring. Table 2-2 shows livestock grazing data for the STSA.

The eastern portion of the STSA (Mexican Mountain area) has a small population (25 to 50) of wild burros. The extreme southwestern portion, 3,000 acres of the STSA in the Muddy Creek area, is the northern end of the range for a small herd (less than 50) of wild horses.

Visual Resources

The primary natural resource requiring special protection within the San Rafael STSA is its outstanding visual quality. The area contains three visual resource management (VRM) classes, which are explained as follows:

- *Class II:* Any changes in the viewing area should not be noticeable in the landscape character.
- *Class III:* Any changes taking place can be evident; however, their characteristics should not subordinate those of the landscape.
- *Class IV:* Any changes should reflect a natural occurrence within the characteristic landscape.

Approximately 54 percent of the STSA is in VRM Class II, 15 percent in Class III, and 31 percent in Class IV.

In addition, a scenic corridor exists along I-70 through the center of the STSA. Over 600,000 people passed through the San Rafael Swell along I-70 in 1980. The sawtoothed San Rafael Reef can be seen on the east, and grass-covered flats with sandstone mesas and pinnacles are visible farther to the west. Scenery is considered outstanding, and there are scenic overlooks in the vicinity of Mexican Mountain, Sid's Mountain, and Devil's Canyon (Ghost Rock).

Cultural Resources

The San Rafael Swell contains both prehistoric and historic sites, although no cultural resource inventory has been made. While only one site (Swasey's Leap) is actually known to occur on Federal lands within the STSA, another site is immediately adjacent and several others are nearby or on State lands within the STSA. It is probable that additional sites occur within the STSA or the general vicinity.

The site adjacent to the STSA is a prehistoric site in the Black Dragon Canyon. This site is listed in the National Register, which consists of two large pictograph panels and a cave. Two more National Register sites are located in the vicinity. The Buckhorn Archaeological District is within 2 miles of the STSA in Buckhorn Wash, and the Temple Mountain pictograph panel is located on State land within the STSA.

Three other sites in the vicinity of the STSA are listed on the State Register of Historic Places. These are the Lone Warrior pictograph, located 1 mile south of the Ghost Rock overlook on I-70; the Head of Sinbad pictograph panel, located 2 miles north of I-70; and the Swasey's Cabin historic site, also located near Ghost Rock.

TABLE 2-2

Livestock Grazing Data
for the San Rafael Swell STSA

Allotment	Season of Use	AUMs	Approximate Percent of Allotment in STSA
Big Pond	10/1-3/31	2,250	14
Black Dragon	11/1-4/15	3,223	32
George's Draw	10/1-2/28	988	8
Globe Link	11/1-4/30	600	38
Head of Sinbad	6/16-10/15	780	9
Iron Wash	9/1-6/30	4,980	0 (less than 1 percent)
Lone Tree	12/16-5/31	5,271	1
McKay Flat	11/1-4/15	2,228	2
North Sinbad	11/1-5/10	3,200	51
Oil Well Flat	11/1-5/31	2,613	23
Red Canyon	10/16-3/15	2,247	28
Saddle Horse Canyon	3/1-8/31	222	1
South Sid and Charlie	11/16-6/15	952	4
Taylor Flat	11/1-4/30	2,028	24
Temple Mountain	10/16-4/15	618	76

SAN RAFAEL SWELL STSA

Recreation

The San Rafael STSA contains a significant number and variety of recreational resources. One perennial river, the San Rafael, meanders and cuts its way through the STSA. The San Rafael Management Framework Plan (MFP) (USDI, BLM, 1979b) recommends it be designated a Study River under the Wild and Scenic Rivers Act. The northern portion of the river winds through a grand, cliff-walled gorge from 1,000 to 2,000 feet deep. This portion of the San Rafael is noted in its nickname, Little Grand Canyon. Rafting and canoeing opportunities are present during the spring months, and tubing and hiking thereafter. It was estimated that well over 200 people floated the northern stretch (Fuller's Bottom to San Rafael Bridge) from June to July 1982. Approximately 150 people hiked the river area in 1982. The lower portion of this stretch (0.45 miles) is within the STSA.

The river changes character from its smooth, winding behavior as it displays unusual power through the mysterious Black Box in the Mexican Mountain area. Hiking and boating along this river stretch is much more technical and dangerous. User numbers are lower because few are daring enough to try it. Most of the recreation enjoyment in this portion is generated by those viewing the area by foot or vehicle. The greatest amount of visitation occurs during the spring months and can reach over 600 recreationists during an Easter weekend (Utah State University, 1982).

Portions of four potential RMAs, identified by BLM in 1982, fall within the STSA. These are the Mexican Mountain, Buckhorn Draw, Sid's Mountain, and Goblin Valley/-Temple Mountain RMAs. All are compatible with recreation recommendations contained in the San Rafael MFP.

The proposed Buckhorn Draw RMA contains 43,000 acres of public land. Scenic vistas and a vertical-walled redrock canyon system attract thousands of visitors each year. The area provides a primitive to semi-primitive-/motorized spectrum of year-round recreation opportunities. The San Rafael Bridge Campground of the proposed RMA (located in the STSA) is one of only two campground areas in the desert terrain of the San Rafael Swell and is adjacent to the San Rafael River. The campground is used heavily during the spring months, mostly by local residents. Recreation activities include camping, picnicking, and off-road vehicle (ORV) use. The area's location and easy access allow for popular recreational use during a period when access to the surrounding mountain region is restricted because of weather conditions.

Of the RMAs, the Goblin Valley/Temple Mountain unit would cause the most concern when considering the proposed mining activities. The area is adjacent to Goblin Valley State Park. The Park serves as a staging ground for recreationists using the surrounding terrain for ORVs and exploration activities. Approximately 20,314 people visited the Park in 1981. Forty percent of the recreation activity conducted was ORV use outside the Park. Cooperation with the Utah State Parks and Recreation Service has helped identify management problems.

San Rafael Reef, Mexican Mountain, and Sid's Mountain have been recommended in the San Rafael Swell MFP for possible designation as Areas of Critical and Environmental Concern (ACECs) or Natural Areas. Past public interest

and planning documents have indicated the necessity for special designation of these areas (USDI, BLM, 1979b).

Wilderness

A significant portion of the San Rafael Swell STSA contains wilderness values. Approximately 24 percent of the area is in WSA or Instant Study Area (ISA) status. The following lists the approximate acreages and percentages of the STSA in WSA status. (Figure 2-6 shows locations of these areas.)

Wilderness Study Area ^a	Total WSA Acreage	Approximate WSA Acreage in STSA	Percent of WSA in STSA	Percent of STSA
Sid's Mountain (UT-060-023)	80,530	1,280	1.6	1.1
Devils Canyon (UT-060-025)	9,610	640	7	0.6
Crack Canyon (UT-060-028A)	25,315	480	2	0.4
San Rafael Reef (UT-060-029A)	55,540	1,280	2	1.1
Mexican Mountain (UT-060-054)	60,360	23,900	40	20.7
Link Flats (ISA)	912	452	53	0.5
TOTAL	232,267	28,032	12	24.4

^aAll figures are based on Federal acreage, exclusive of any State or private inholdings.

Existing Land Uses and Land Use Plans

The STSA falls within the BLM San Rafael Resource Area, Moab District, and is managed under the San Rafael MFP (USDI, BLM, 1979b). Base information is contained in the San Rafael Unit Resource Analysis (URA) (USDI, BLM, 1979b).

Existing land uses are primarily recreation, livestock grazing, and mineral exploration, development, and production. In 1982, mining decreased because of the economic downturn in the uranium market.

UDOT has rights-of-way for I-70. It also holds a right-of-way for a runaway truck zone and a temporary use permit for an associated experimental solar-powered warning light.

There are several roads in the area which are maintained by Emery County or BLM. A right-of-way has been issued to BLM for the San Rafael Campground.

The STSA lies in central Emery County, Utah. Emery County is one of the largest counties in Utah, containing 2,842,880 acres. Of this, about 80 percent is owned by the Federal government; over 2 million acres are managed by BLM. The county is sparsely populated (population 11,451 [U.S. Department of Commerce, Bureau of the Census, 1980]). There are eleven small communities in the county. Green River lies about 10 miles east of the STSA on I-70; the remaining communities are located in Castle Valley northwest of the San Rafael Swell.

Emery County completed a zoning plan in 1980. The STSA is located in an area zoned for mining and grazing.

Socioeconomics

The socioeconomic effects of mining development in the STSA would be mostly confined to Emery and northern Wayne counties. The communities in Castle Valley, Green River, and Hanksville are all within 25 miles of the STSA and would be the most heavily affected communities. Some effects could occur to Price, since it is the major service center for the area.

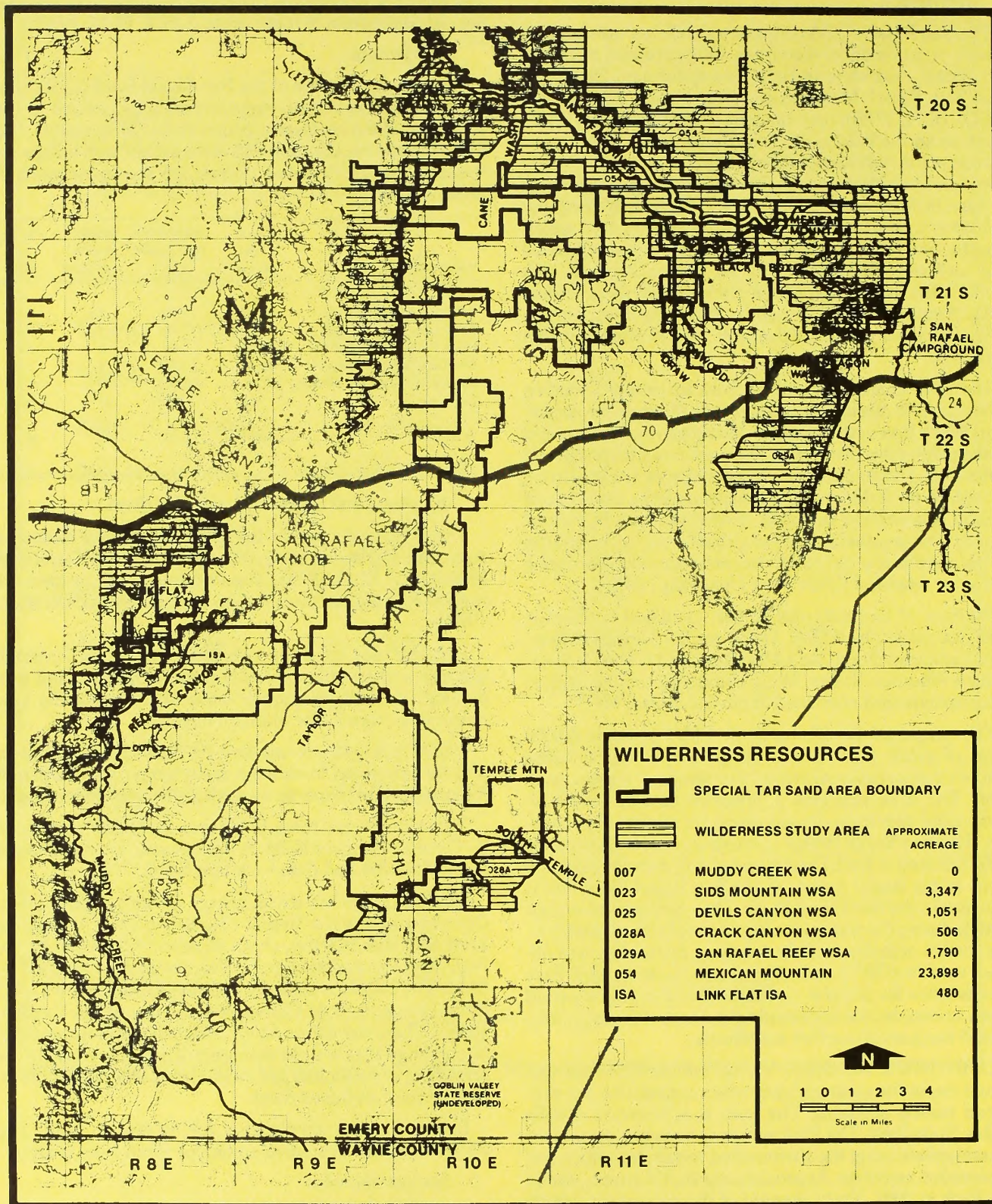


FIGURE 2-6
WILDERNESS RESOURCES IN SAN RAFAEL SWELL STSA

COUNTY DEMOGRAPHICS AND ECONOMY: Periods of growth and decline in Emery County have historically been linked to the coal industry. The rapid growth of Emery's coal industry and the construction and operation of several new electrical generating plants fueled a 123-percent increase in population between 1970 and 1980 (see Table 2-3).

Natural growth accounted for much of the increased revenue in the early 1970s. Even through national recessions, the area's unemployment rates have averaged under 5 percent. Considering the normal unemployment caused by job transitions, this low rate signifies a fully employed labor force. Because the region's labor force has been nearly fully employed, the increased employment requirements in the later 1970s have resulted in immigration to the area.

The latest national recession (1982), which has temporarily halted growth in local coal production, led to a 13-percent reduction in coal employment between 1981 and 1982. Mining is the largest employer (36 percent of total employment) and source of income. Construction and operation of power plants also account for a large share of the region's employment and income (see Table 2-4).

The Utah Office of the State Planning Coordinator (1982) projects that coal production in Carbon and Emery counties will reach 21.6 million tons by 1990. Using this assumption, a baseline population of 14,702 (+21 percent) is projected for Emery County by the year 2,000 (see Table 2-4).

In 1980, total income in Emery County amounted to \$102,290,000; there was a total of 5,935 jobs. For Wayne County, total income amounted to \$8,245,000; there was a total of 662 jobs. In October 1982, the civilian labor force had increased by 5 percent to 7,430 persons in Emery County. In Wayne County, the civilian labor force increased by 7 percent (1,045 persons).

All communities in Castle Valley, except for Emery, more than doubled their population between 1970 and 1980. Nearly all the existing infrastructures have had to be revamped. High interest rates have discouraged housing construction and, coupled with rapid population growth, have resulted in a serious housing shortage. Much of the housing demand has been accommodated through mobile homes. Thirty-three percent of the housing units in Emery County are mobile homes. A number of roads, particularly those by new housing developments, are unpaved and lack sidewalks. The Emery County School District has undertaken a building program and has spent over \$1,500 per capita for construction over the past 5 years. All communities in Castle Valley have had to upgrade their water and sewer systems. Most of the communities lack adequate water supplies to accommodate their projected 1985 to 1990 populations. Except for Emery and Ferron, sewer systems are not as serious a problem as water supplies.

Fiscal problems in Castle Valley are typical of accelerated population growth. Most local government agencies in Emery County experience problems in: (1) the lag between immediate costs and future additional revenues; and (2) the relative difference between the growth-related revenues collected by each unit of local government and the costs each must bear. Local officials also claim that fiscal problems have been aggravated by the relatively low property taxes paid by companies owning coal mines.

Green River is located 15 miles east of the STSA boundary. Of all the communities near the STSA, Green River has the best access to the STSA. Unlike the rest of Emery County, Green River has not grown in the past 30 years. Major employment includes mining, government, agriculture, and tourism. Recent uranium mine layoffs have significantly increased unemployment in the area. Because the community's population has remained stable over the past 30 years, its infrastructure has required only minor adjustments, and problems associated with population growth have not occurred.

Hanksville is a small community located 25 miles south of the STSA boundary. It has few services; those available include several gas stations, a general store, a motel, and a restaurant. Major local employment includes government, mining, and agriculture. Most mining jobs are located outside Wayne County. Recent layoffs (1982) in the uranium industry have had a significant impact on the community, and local unemployment rates are high.

ECONOMIC-RELATED ACTIVITIES: The STSA is an important source of winter and spring livestock forage for several livestock operators. For the most part, expenditures associated with recreation in and around the STSA are well distributed among businesses in Emery County; these expenditures are of low local importance. However, they could be significant to the commercial outfitters occasionally using the area.

PUBLIC ATTITUDES: Accelerated growth in Castle Valley has resulted in social change and loss of some lifestyle values and introduction of other values. Immigration has brought a heterogeneous population into a previously homogeneous culture. Local governments and residents are now aware of the consequences of rapid growth and are wary of projects that may cause further growth. However, local governments are learning how to plan for growth and, given adequate funding, can deal with future growth better than they have in the past.

Because Green River has not had to deal with rapid growth recently and because both Green River and Hanksville residents are suffering from a depressed uranium market, the attitude toward growth in these communities is more favorable.

ENVIRONMENTAL CONSEQUENCES

Tar Sand Resources

Tar sand development could occur using two methods: The first, surface mining, would require a tar sand processing plant located nearby or at the mine site. The plant would extract the tar using heat, steam, solvents, or a combination of these processes. The second method (in situ) would involve a series of injection and production wells with the tar sand flooded by steam, hot water, solvents, or a combination of these processes. Present industry interest is limited to in-situ methods. Several hundred feet of overburden are required for in-situ development; therefore, this method would be limited in the San Rafael Swell STSA. Also, land reclamation measures with this method would be fewer than those required for development by surface mining. Underground mining is a remote possibility.

Once development of tar sand was completed, any

TABLE 2-3

Historic and Baseline-Projected Populations
for Development of the San Rafael Swell STSA

Location	1970	1980	1981	1985	1990	1995	2000
EMERY COUNTY	5,137	11,451	12,100	14,078	14,778	15,062	14,702
Castle Dale- Huntington CCD ^a	2,961	7,836		9,783	10,438	10,613	10,335
Castle Dale City	541	1,910					
Cleveland Town	244	522					
Elmo Town	141	300					
Huntington City	857	2,316					
Orangeville City	511	1,309					
Emery-Ferron CCD ^a	1,077	2,500		3,278	3,202	3,261	3,187
Emery Town	216	372					
Ferron City	663	1,718					
Green River CCD ^a	1,099	2,215		1,017	1,138	1,188	1,180
Green River	969	956					
GRAND COUNTY							
Green River	64	92					
WAYNE COUNTY							
Hanksville CCD ^b	181	351					

SOURCE: U.S. Department of Commerce (USDC), 1981.
Utah Office of the State Planning Coordinator, 1982.

^aProjected growth without tar sand development.

^bCCD = Census County Division

TABLE 2-4

Income and Employment Data for
Emery and Wayne Counties in 1980

	Emery County		Wayne County	
	Income (Percent)	Employment (Full & Part-Time) (Percent)	Income (Percent)	Employment (Full & Part-Time) (Percent)
Farm	0.4	9	11	29
Non-farm	99.6	91	89	71
Private	92	76	64	40
Ag. Serv. & Forest	a--	--	1	1
Mining	59	a43	a--	3
Construction	16	11	a--	12
Manufacturing	--	--	4	6
Transport & Pub.				
Utilities	a--	11	2	1
Wholesale Trade	--	--	1	1
Retail Trade	2	6	6	6
FIRE ^b	1	1	a--	5
Services	a--	4	5	5
Government	7	14	25	30
Federal	1	3	11	14
State & Local	6	12	14	16

Source: USDC, 1982a: Utah Department of Employment Security (UDES), 1982

Note: Income and employment figures are listed by place of work. Employment percentages do not include proprietors' employment and, therefore, underestimate the relative importance of agriculture. Numbers may not be additive because of rounding.

^aNot shown to avoid disclosure of confidential data.

^bFinance, insurance, and real estate.

CHAP 2: ALTERNATIVE EVALUATIONS

remaining tar sand would be foregone. Although tar sand could be leased, development would be subject to the strictest nonimpairment standard within WSAs, which could exclude tar sand development. Approximately 24 percent (28,232 acres) of the STSA is under IMP status (see Figure 2-6).

ALTERNATIVE 1, DEVELOPMENT: All of the area's tar sand deposits (115,705 acres) would be available for leasing. However, limited data do not allow quantification beyond the acreage affected. This would make approximately 500 million barrels of in-place bitumen available for development. Even in category 1 (open to leasing) a plan of operations would have to be approved by BLM. That approval process places constraints and stipulations on operational activities to protect environmental concerns. Beyond the standard stipulations listed in Appendix 1, these constraints cannot be determined at this time.

ALTERNATIVE 2, NO ACTION: Approximately 66 percent (76,828 acres) of the STSA would be in category 1 and would be available for tar sand leasing development (see Figure 2-2). This would make 330 million barrels of bitumen available in place. The remaining 34 percent (34,977 acres) of the STSA would be in categories 3 and 4. Category 4 (no leasing) precludes any type of lease because of environmental or legal concerns. Consequently, tar sand resources in category 4 areas would be foregone.

Category 3 (no surface occupancy) also restricts exploration and development activities. It would preclude surface mining altogether, but would allow limited development of the hydrocarbon resource through directional drilling associated with conventional oil and gas recovery and possibly in-situ tar sand development.

Category 3 would provide some hydrocarbon development around the edges of category 4 areas. In most cases, tar sand development would be impractical in these areas, and the exercise of lease rights would be limited to conventional oil and gas development through directional drilling. Therefore, most of the tar sand resources in category 3 areas would be foregone. This category includes 18 percent of the STSA.

ALTERNATIVE 3, MULTIPLE USE (PREFERRED ALTERNATIVE): Approximately 70 percent (81,414 acres) of the STSA would be in category 1 and would be available for tar sand leasing development (see Figure 2-3). This would make 350 million barrels of bitumen available in place. The remaining 30 percent (34,291 acres) of the STSA would be in categories 3 and 4. Category 4 (no lease) precludes any type of lease because of environmental or legal concerns. Consequently, tar sand resources in category 4 areas would be foregone.

Impacts from tar sand leasing on category 1, 3, and 4 areas would be similar to those in Alternative 2; however, 11,235 fewer acres would be placed under category 3 and 4 restrictions. Approximately 27,628 acres (24 percent of the STSA) would be closed to tar sand development.

Category 2 would place lease stipulations on CHL development in areas having important environmental concern at the time of leasing. These constraints would be significant, although they would not completely preclude development of hydrocarbon resources. Because areas under category 2 would place special stipulations on surface occupancy, impacts to tar sand in these areas would gener-

ally be the same as those occurring under category 3. Therefore, the majority of the tar sand resource would be foregone, affecting approximately 6,663 acres (6 percent of the STSA).

ALTERNATIVE 4, RESTRICTIVE DEVELOPMENT: Approximately 58 percent (67,657 acres) of the STSA would be in category 1 and would be available for tar sand leasing development (see Figure 2-4). This would make 290 million barrels of bitumen available in place. The remaining 30 percent (34,291 acres) would be in categories 3 and 4. Category 4 (no leasing) precludes any type of lease because of environmental or legal concerns. Consequently, tar sand resources in category 4 areas would be foregone.

Impacts to tar sand development would be the same as Alternative 3, except that 20,420 additional acres (18 percent of the STSA) would be under category 2 restrictions. This restriction would be the same as Alternative 3 in the floodplain area (6,663 acres). While most of the 13,757 acres could be developed, Temple Mountain and Goblin Valley RMA would be limited to category 2 with restrictions.

Because approximately 24 percent of the STSA is under IMP status (see Figure 2-6), any CHL would be subject to the strictest nonimpairment standard. This, in all probability, would exclude tar sand development.

Other Mineral Resources

Surface mining of tar sand would require removal of the uranium-bearing Chinle formation. This would result in loss of uranium deposits wherever they overlaid tar sand. Similar impacts would occur to any copper deposits, because the Navajo formation would be overburden associated with tar sand.

In-situ extraction methods would interfere with uranium development because of the number of wells penetrating the Chinle and/or Navajo formations. Additional impacts could occur from flooding, burning, and subsidence associated with in-situ tar sand extraction.

In those areas where copper and uranium overlap, there would be a potential conflict with tar sand development. However, because of little demand, current production, and economic feasibility, significant impacts to uranium and copper would not be expected.

ALTERNATIVE 1, DEVELOPMENT: Uranium- and copper-bearing formations occur throughout the STSA. Disturbance would be allowed in all involved formations.

ALTERNATIVE 2, NO ACTION: As described above, uranium- and copper-bearing formations would be disturbed on up to 66 percent of the STSA (see Figure 2-2).

ALTERNATIVE 3, MULTIPLE USE (PREFERRED ALTERNATIVE): Alternative 3 would result in similar impacts to uranium and copper formations as those described above. Up to 70 percent of the STSA could be affected. Tar sand in the Muddy Creek area near the Lucky Strike Mine would somewhat reduce the chance for tar sand/uranium conflicts.

ALTERNATIVE 4, RESTRICTED DEVELOPMENT: Alternative 4 would result in the same impacts to uranium and copper as Alternative 1 on 58 percent of the STSA. While this alternative is more restrictive, tar sand development could occur on an additional 12 percent of the

STSA on category 2 areas.

Other Resource Values and Uses

AIR QUALITY: Many of the problems associated with coal surface mining (i.e., wind-blown particulates) would be common to surface mining of tar sand. Additionally, all surface processing (hot water, solvent, and surface retorting) would require the introduction of heat. These boilers or furnaces would probably be fired by residual oil or coal and would result in emissions of sulfur dioxide (SO₂), nitrogen oxide (NO), nitrogen dioxide (NO₂), and particulate matter. Removal of any ash, coke, waste water, or other materials would require adequate controls.

In-situ technologies could also pose serious air quality problems. Both the steam-drive and fire-flooding processes burn coal or the produced crude to operate engines for steam generators or air compressors. The combustion process results in the production of SO₂ and particulate matter and the formation of NO and NO₂.

Alternatives 1 through 4: Impacts would be similar to those described above; however, the extent could be different, depending on the extent of development.

GEOLOGY AND TOPOGRAPHY: Surface mining could cause major alterations in local topography. Depending upon the depth of overburden and thickness of tar sand deposits, several hundred feet of soil and rock could be removed. Disposal of waste rock and tailings could create hills or mounds or be used to fill in drainages. In-situ mining would have no major effect on geology or topography except for possible subsidence, which would be limited to a few vertical feet.

Alternatives 1 through 4: All of the above-mentioned impacts could occur; however, the extent of impacts could vary under each alternative, depending on the extent of development.

SOILS: Soil disturbance from in-situ development would result from roads, drill pads, pipelines, and ancillary facilities. With surface mining, soils and cover could be lost during development.

Surface disturbance associated with tar sand development would increase erosion. This would also increase salt and sediment yields on the Colorado River system. The rate of accelerated erosion would depend on the area and soil types. While wind erosion would not be expected to increase salt and sediment loads on the Colorado River system, wind movement of soil particles could affect revegetation attempts on disturbed and adjacent areas and, therefore, indirectly affect water erosion. Revegetation attempts to control erosion on disturbed areas could be expected to range from very poor to fair. Reclamation in areas devoid of soil (i.e., slickrock) would not be practical.

Alternative 1, Development: All of the above-mentioned impacts could occur throughout the STSA if development occurred.

Alternative 2, No Action: Alternative 2 would place 34 percent of the STSA in categories 3 and 4 to protect sensitive areas from soil erosion (see Figure 2-2). Sixty-six percent (76,828 acres) of the STSA could be subject to increased erosion. All impacts to soils mentioned above would occur wherever tar sand exploration and development occurred.

Alternative 3, Multiple Use (Preferred Alternative): Impacts to soils would be similar to those mentioned above in most cases. Surface disturbance could increase erosion on 70 percent (81,414 acres) of the STSA. Category 2 restrictions in the San Rafael River floodplain and the Muddy Creek area would offer protection on 6 percent (6,663 acres) of the STSA. This protection would not be as effective as categories 3 or 4, but would limit surface disturbance.

Alternative 4, Restricted Development: This alternative would result in nearly identical impacts as Alternative 3 on 58 percent of the STSA. However, in addition, surface disturbance would be limited on the Temple Mountain/-Goblin Valley RMA (12 percent of the STSA) because of the category 2 designation. However, total soil loss would probably be similar to Alternative 3.

VEGETATION: Any surface tar sand development would permanently alter vegetation, while development by in-situ methods would temporarily disturb vegetation. Generally, within the Moab District, reclamation would allow reestablishment of native vegetation within 2 to 4 years after disturbance in areas receiving greater than 10 inches of annual precipitation. Reclamation in areas with very shallow soils and in desert shrub communities might be only partially successful. Prior to any surface disturbance, a proper inventory would be conducted and consultation with FWS under the Threatened and Endangered Species Act would be conducted, if necessary.

Alternative 1, Development: The above-mentioned impacts could occur throughout the STSA wherever tar sand exploration or mining occurred.

Alternative 2, No Action: The impacts mentioned above could occur on 66 percent (76,828 acres) of the STSA. Category 3 and 4 areas would not be affected (see Figure 2-2). These two categories would include much of the area considered difficult to reclaim and revegetate.

Alternative 3, Multiple Use (Preferred Alternative): This alternative would place 24 percent of the STSA in categories 3 and 4; approximately 9 percent of the STSA would be in category 2. The impacts discussed above could occur on 70 percent (81,414 acres) of the STSA in areas placed in categories 1 and 2. The stipulations for category 2 areas restrict the type of mining activities but do not prevent them from occurring. The location for proposed categories are shown in Figure 2-3.

Alternative 4, Restricted Development: Alternative 4 would result in similar impacts to vegetation as Alternative 3, even though an additional 13,757 acres would be placed in category 2 (see Figure 2-4). The additional category 2 area would restrict the location of mining activities in a visually scenic corridor, but mining and exploration could occur.

WATER RESOURCES: Surface mining could negatively impact local aquifers and springs through obliteration and contamination. In-situ mining and surface exploration would have much less impact than surface mining on such water sources. Mining and exploration activities would produce some negative impact to salt loading of the Colorado River system through increased erosion. Mitigation would require site-specific protection as part of a plan of operation, restrictions on mining and exploration in extreme topography, and buffer zones along major drainages.

Alternative 1, Development: All of the above-mentioned impacts could occur throughout all or part of the STSA in areas of tar sand development.

Alternative 2, No Action: Alternative 2 maintains 34 percent of the STSA in the more restrictive categories 3 and 4. This would eliminate most of the potential impacts to water resources, especially in areas of extreme topography. Floodplain protection would not be ensured along the San Rafael River, and some water pollution would be possible.

Alternative 3, Multiple Use (Preferred Alternative): This alternative would have impacts similar to Alternative 2, except that the San Rafael River floodplain and riparian areas would receive additional protection by category 2 stipulations.

Alternative 4, Restricted Development: Impacts would be identical to those occurring under Alternative 3.

WILDLIFE: Mining activities, especially surface mining, would have an exclusionary effect on bighorn sheep. Areas of intense mining or exploration would not be used by these animals for at least the duration of the activity. After final reclamation was complete, reuse of such areas by bighorn sheep could not be ensured. A reintroduction of bighorn sheep would probably be necessary.

Eagles are protected under the Eagle Protection Act and, therefore, development activities would not be allowed within a 1- to 2-mile radius of nest sites under any alternative.

Loss of wildlife habitat, including habitat of the endangered peregrine falcon, by degradation of the San Rafael River floodplain (riparian habitat) could occur under Alternatives 1 and 2.

Alternative 1, Development: The above-mentioned impacts to bighorn sheep and wildlife habitat could occur.

Alternative 2, No Action: Bighorn sheep and much of their principal habitat would be in the category 3 and 4 areas of Mexican and Sid's mountains (See Figure 2-2). Therefore, little impact to this species or their habitat would occur. Impacts to other wildlife species could occur on 66 percent of the STSA.

Alternative 3, Multiple Use (Preferred Alternative): Slight impacts would occur to bighorn sheep habitat. Impacts to other wildlife would not occur because riparian habitat along the San Rafael River would be protected through category 2 stipulations.

Alternative 4, Restricted Development: Impacts would be similar to those occurring under Alternative 3 because wildlife use areas would be given the same amount of protection.

LIVESTOCK AND AGRICULTURE: Surface mining would cause a loss of forage for livestock, while in-situ development and exploration activities would cause temporary forage loss for livestock during the period of development. Reclamation and revegetation efforts requiring 2-4 years after development would reduce, although not eliminate, the impact. If perched water tables were impacted by surface or in-situ mining, loss of springs would affect livestock use. Similar impacts could be expected to extend to wild horse and burro ranges.

Alternative 1, Development: All of the above-mentioned impacts could occur.

Alternatives 2, 3, and 4: These alternatives would protect most of the wild horse and burro habitat from surface disturbance on lands under categories 2, 3, and 4 (see Figure 2-2). Livestock forage resources would be affected in category 1 areas only (66 to 70 percent of the STSA).

VISUAL RESOURCES: Road construction, exploration activities, or mining could degrade the visual quality of the STSA landscape. Degradation in rugged topography and along the I-70 corridor would be most sensitive and would cause the most concern. Surface mining would have the greatest impacts to visual quality. Heavy facility development associated with in-situ mining could result in visual impacts from a high density of roads, pads, drilling rigs, and production facilities.

Alternative 1, Development: All of the above-mentioned impacts could occur.

Alternative 2, No Action: Mining and exploration activities could occur on the surface on 66 percent of the STSA; however, these activities and the resulting impacts on visual resources would be prevented by category 3 and 4 designations along I-70 and in the more extreme topography in the Muddy Creek, Sid's Mountain, and Mexican Mountain areas (see Figure 2-2).

Alternative 3, Multiple Use (Preferred Alternative): Mining and exploration activities could occur on the surface of 70 percent of the STSA. The sensitive areas mentioned under Alternative 2 would not be available for surface mining because of category 3 and 4 designations, as well as additional category 2 stipulations.

Alternative 4, Restricted Development: Impacts would be similar to those occurring under Alternative 3 with an exception in the Temple Mountain/Goblin Valley area (see Figure 2-4). That area (approximately 13,757 acres) would be placed in category 2, which would limit the placement of facilities along the Temple Mountain road, thus reducing visual intrusions and loss of visitor satisfaction in the Goblin Valley State Park and surrounding area.

CULTURAL RESOURCES: Under all alternatives, cultural resources could be inadvertently destroyed from mining-related activities and vandalism. In such cases, an undetermined amount of archaeological resources would be permanently destroyed. Most exploration activities and in-situ tar sand development could avoid or salvage archaeological sites.

RECREATION: Impacts to recreational values would occur from several change agents: (1) surface disturbance from surface mining; (2) impairment of recreational experience by physical presence of mines, buildings, tanks, etc.; and (3) secondary impacts from increased use by construction and mine employees.

Users of the Buckhorn Canyon area of the San Rafael Swell, Head of Sinbad, Black Dragon Canyon, Link Flats, and Temple Mountain/Goblin Valley areas would be forced to use other areas that might or might not substitute their experiences. Development of these areas would eliminate the traditional activities and enjoyment for recreational users. This displacement could create further problems (i.e., resource degradation to areas not compatible with planned activities, vandalism, litter, user dissatisfaction, etc.).

Similar impacts to river users would occur even if the San Rafael River itself were not affected by mining and exploration. Development activity, especially surface mining, could reduce natural values of the San Rafael Reef, Mexican Mountain and Sid's Mountain for recreational uses.

Alternative 1, Development: All of the above-mentioned impacts could occur throughout the STSA.

Alternative 2, No Action: The above-mentioned impacts could occur on 67 percent of the STSA. The following areas would not be affected: Mexican Mountain, Sid's Mountain, San Rafael Campground (partial), I-70 scenic corridor, Copper Globe area, Sulfur Canyon, and Cat and Hebe canyons (see Figure 2-2). These areas would be excluded from surface occupancy or leasing because of their placement in categories 3 and 4.

Alternative 3, Multiple Use (Preferred Alternative): Approximately 24 percent of the STSA would be in categories 3 and 4. This would preclude any surface occupancy on Sid's Mountain, Mexican Mountain, I-70 scenic corridor, and Muddy Creek; therefore, the impacts mentioned above would not occur in these areas. The San Rafael River floodplain would be placed in category 2, thereby eliminating any impacts to recreation use on and along the river. Protection of the San Rafael Campground area would be expanded by 80 acres to prevent intrusion into the immediate campground. Impacts mentioned above could occur in the Temple Mountain area.

Alternative 4, Restricted Development: Impacts would be the same as those occurring under Alternative 3, except that the Temple Mountain/Goblin Valley RMA (13,757 acres) would be placed in category 2 (see Figure 2-4). This would restrict placement of mines and associated facilities within the Temple Mountain road viewing area, thereby reducing the dissatisfaction experienced by recreationists using that area.

WILDERNESS: See Introduction to this chapter.

LAND USES AND LAND USE PLANS: Land uses in the STSA would shift from livestock grazing and recreation to tar sand development.

Impacts to livestock grazing and recreation would occur as mining and tar sand development were achieved. These topics are discussed in individual sections. Development would not conflict with Emery County zoning ordinances. Existing rights-of-way are valid existing rights and would be protected during development.

SOCIOECONOMICS: Most of the socioeconomic effects would occur in southern Castle Valley, Hanksville, and particularly Green River, because of their proximity, available labor force, and the ability of their infrastructure to accommodate a larger population.

In the long run, employment in Emery County would increase. Some of the housing needs could be accommodated by existing housing in Green River. However, additional housing would be needed. New retail and service businesses would occur as population increased. Major public facilities and services in Green River are well posi-

oned to accommodate increased population. Problems could arise in Castle Valley, where most communities are still suffering infrastructural shortcomings from the rapid population growth which occurred between 1970 and 1981.

Local government would bear additional costs and receive additional revenues from developing tar sand resources in the STSA. Some of the fiscal problems which could arise from development include: (1) the time lag between the cost burden on affected units of local government and the normal beginning of additional tax revenue receipts; and (2) the relative difference between the development-related revenues collected by each unit of local government and the costs each unit would be required to bear.

The tar sand resource would be assessed by the State as nonmetal property: assessed value is undetermined at this time. Federal and State governments would each receive 50 percent of the Federal royalties assessed for hydrocarbon production and, in the case of new leases, bonus bids. Developers could be required to submit an economic development plan on the expected size of each tar sand development to the affected units of local governments (Emery County, 1979; Bunnell, 1981). Utah Senate Bill 170 allows developers to mitigate fiscal impacts through sales and property tax prepayments, which could be credited to future taxes. Emery County's zoning resolution requires county approval of the development before it issues the necessary rezoning and conditional use permits. The county would, therefore, have some control over the developer's mitigation of local socioeconomic impacts.

Forage loss resulting from surface activities would have some economic impact to ranchers now using the area. Tar sand development would displace some of the STSA's existing recreation use. The reduced expenditures would be of low significance locally to all but commercial outfitters, who occasionally use the area.

Expected population growth resulting from tar sand development would not significantly affect existing social conditions. Because Green River and Hanksville are experiencing high unemployment rates, attitudes towards growth in these communities would be more favorable than in Castle Valley.

Alternative 1, Development: All the above-mentioned impacts would occur.

Alternative 2, No Action: Because 34 percent of the STSA would be in the more restrictive leasing categories (3 and 4), the related socioeconomic effects would be less than those occurring under Alternative 1. However, the exact difference in impacts cannot be determined with available data.

Alternative 3, Multiple Use: Because 24 percent of the STSA would be in the highly restrictive leasing categories (3 and 4) the related socioeconomic effects would be less than those occurring under Alternative 1, but greater than those occurring under Alternative 2. However, the exact difference in impacts cannot be determined with available data.

Alternative 4, Restricted Development: Impacts would be identical to those occurring under Alternative 3.

Sunnyside and Vicinity STSA (Southern Portion)

MAJOR ISSUES

The southern portion of the Sunnyside and Vicinity STSA is primarily a high, forested plateau dipping to the east. It is dissected by many steep canyons which drain into the Price and Green rivers. Much of the area is heavily forested with spruce, fir, and aspen above 8,000 feet. Pinyon and juniper dominate the lower elevations. Scattered throughout the STSA are large meadows and sagebrush parks. The area abounds with deer, elk, sage grouse, and many other wildlife species. Higher elevations are similar to the Manti-La Sal and Ashley National Forests to the north and west.

Major issues are as follows:

- **Watershed:** Part of the west face of the Roan Cliffs is located within the STSA. Slopes can average in excess of 100 percent, with an extreme erosion potential when disturbed. Public Law 294 (PL-294) was passed in 1921 to protect a part of the Sunnyside municipal watershed from surface disturbance. This water reserve is within the STSA. There are also many smaller public water reserves scattered throughout the STSA. Steep canyon slopes and highly erodible soils will require careful mitigation to protect water quality and quantity.
- **Underground Aquifers:** Many of the numerous springs, seeps, and mountain streams found within and around the STSA may derive their source water from aquifers located above the tar-sand-bearing formation. Large-scale surface-mining or in-situ extraction methods could damage these water sources. Any significant changes in water quantity or quality could have major impacts on wildlife, livestock, fisheries, and downstream water users.
- **Wildlife:** The STSA contains summer and winter habitat for large numbers of deer. In addition there are elk, sage grouse, forest grouse, occasional moose, and numerous other wildlife species. Large-scale tar sand development, especially surface mining, could reduce wildlife habitat and exclude the wildlife present. UDWR has expressed concern for future development of the STSA.
- **Archaeology:** The northern portion of the STSA encompasses much of the Nine Mile Canyon Archaeological District. It contains a heavy concentration of archaeological sites in the San Rafael Fremont area. A portion of the archaeological district is on the State Register of Historical Sites and was nominated to the National Register of Historical Places in February 1974. Large-scale mining would conflict with the archaeological resources present.
- **Recreation and Visual Resources:** Much of the STSA is rated as having good to outstanding scenery and is in VRM Classes II and III. The Sunnyside and Vicinity STSA is seen by approximately 766,500 motorists traveling surrounding highways per year.

Conflicts with recreational uses (i.e., hunting, fishing, and sightseeing) would be probable from tar sand development.

- **Public Access:** Numerous public roads exist throughout the STSA. Large-scale tar sand development could have a significant effect on use and relocation of roads.
- **Rights-of-Way:** Existing pipeline rights-of-way and a microwave communication site in the heart of the major tar sand deposit would be protected because of valid rights.
- **Livestock Grazing:** Loss of forage use for livestock production.
- **Vegetation:** Loss of vegetative cover to protect the watershed and provide forage and habitat for wildlife and livestock.
- **Wild Horses:** Loss of forage and cover.
- **Wilderness:** Opinion varies as to the extent of protection needed and provided.
- **Split Estate:** In some areas, mineral ownership is Federal, while surface rights are private- or State-owned. Approximately 19,348 acres of the STSA are in this category. Any decision regarding operation of a CHL would involve consultation with the surface owner, BLM representatives, and the CHL lessee or operator prior to surface disturbance or exercising of the lease. Concerns would be presented at one or more joint on-site inspections and when a plan of operation was submitted by a valid lessee or operator. This site-specific issue would also be addressed in a subsequent environmental analysis prior to approval of any plan of operation.

ALTERNATIVES

Alternative 1: No Action/Maximum Development (Existing Oil and Gas Category System)

Both competitive CHLs and conversions would be subject to the oil and gas category system established in 1975 (see Figure 2-7). The entire STSA would be placed in category 1 (open to leasing), except for the Sunnyside Water Supply Reserve and a portion of the Green River corridor. The Sunnyside Water Supply Reserve would be placed in category 4 (no leasing) and the Green River corridor in category 2 (leasing with special stipulations). Oil and gas production, tar sand exploration, and mining could occur with the mitigation measures established in APDs, exploration plans, and plans of operations in category 1 and 2 areas.

The following lists the approximate acres and percent of the STSA in the various categories. All percentages are based on total Federal acreages, exclusive of any State of Utah or private inholdings.

Category	Acres	Percent
1	71,167	95
2	1,420	2
3	0	0
4	2,320	3

FIGURE 2-7
ALTERNATIVE 1, SUNNYSIDE AND VICINITY STSA
(SOUTHERN PORTION)

CHAP 2: ALTERNATIVE EVALUATIONS

Stipulations for category 2 and 4 areas would be as follows:

Sunnyside Water Supply Reserve (Category 4). The Sunnyside Water Supply Reserve was established in 1921 with the passage of PL-294 to protect the municipal watershed of the Town of Sunnyside. The area is partially withdrawn from mineral entry. The majority of the reserve is on steep slopes; consequently, any surface disturbance would create an erosion hazard in a municipal watershed. The stream protected, Range Creek, is a quality trout stream and is used for irrigation, livestock water, and wildlife water.

Desolation and Gray Canyons (Category 2, 1,420 Acres). The segment of the Green River from Sand Wash to Swasey's Rapid (near the Town of Green River) is 84 miles long and is one of the most popular white-water trips in the West. The river received 31,000 visitor use days in 1980 from float boaters, and use continues to grow. In 1969 this segment of the Green River was designated a National Historic Landmark and has potential for Wild and Scenic River status.

The natural values found in and along Desolation and Gray Canyons are impressive. The area encompasses all of the Flat Canyon Archaeological District. The river canyon contains many smaller canyons and floodplains, one of which contains a sensitive trout fishery. In addition, the Green River is critical habitat for three species of endangered fish. Other critical wildlife concerns are (1) known nesting habitat for golden eagles and the endangered peregrine falcon; and (2) critical deer winter range on the lower slopes of the canyon. Because of these and other environmental concerns, a final River Management Plan was approved by BLM in 1979 to manage this section of the Green River. In that Plan, management action No. 5 deals directly with oil and gas development in the canyon and specifies that leasing be suspended along a 1-mile-wide river corridor and APDs within sight or sound of the river not be approved. A high intensity EA has been completed and approved on the River Management Plan, which includes these restrictions on oil and gas development in the canyon.

Alternative 2, Multiple Use

This alternative attempts to balance tar sand development with other resource values and uses. All four leasing categories for CHLs and new competitive leases are considered. The highest value tar sand deposits were placed in the open category, regardless of impacts to wildlife, watershed, vegetation, and suspected aquifers. Tar sand deposits of less value were recommended for oil and gas leasing only. Categories are shown on Figure 2-8 and depict areas within the STSA that have special values (i.e., deer winter range, public water reserves, etc.).

The following lists the approximate acres and percent of the STSA in the various categories. All percentages are based on total Federal acreages, exclusive of any State of Utah or private inholdings in the STSA.

Category	Acres	Percent
1	16,161	21.6
2	49,343	65.8
3	8,966	12.0
4	440	0.6

Following are descriptions of sensitive areas within the STSA. The numbers given are keyed to Figure 2-8.

No. 110, Sunnyside Water Supply Reserve (Category 3, 1,960 Acres; Category 4, 440 Acres). The Sunnyside Water Supply Reserve was established in 1921 with the passage of PL-294 to protect the municipal watershed of the Town of Sunnyside. The area is partially withdrawn from mineral entry. The majority of the reserve is on steep slopes; consequently, any surface disturbance would create an erosion hazard in a municipal watershed. The stream protected, Range Creek, is a quality trout stream and is used for irrigation and livestock and wildlife use.

No. 111, Public Water Reserves/Riparian Areas (Category 3, 3,060 Acres). These areas are the immediate watershed and floodplains of the major perennial and the more significant intermittent streams within the STSA. Much of these category 3 areas have been formally designated as public water reserves. These drainages all contain riparian areas, some of which support trout populations. Activity in these areas would create erosion and sedimentation hazards, as well as a potential for dewatering of the public water reserves.

No. 112, Sage Grouse Strutting and Nesting Grounds (Category 2, 1,758 Acres; Category 3, 478 Acres). The known sage grouse strutting grounds have been placed in category 3, with the surrounding nesting habitat placed in category 2. Mining activity on strutting grounds would eliminate their use by sage grouse; activity in the surrounding nesting habitat would affect nesting success.

Stipulation (category 2 areas):

- Oil and gas resources may be extracted by conventional methods only; no in-situ or mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of BLM.
- To protect nesting sage grouse, exploration, drilling, and other development activity will be allowed only from July 1 to March 31. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

No. 113, Bear and Rock Creek Watersheds (Category 3, 1,960 Acres). Bear and Rock creeks are two of the more important drainages found within the STSA. Rock Creek is a quality trout stream used by thousands of visitors floating the Green River each year. The immediate watersheds of both streams average near 100-percent slope and are highly susceptible to erosion. The steep canyons and stream floodplains have been included in the category 3 recommendation. Surface disturbance in the steep drainages would create an erosion hazard, and reclamation would not be possible.

No. 114, Golden Eagle Nest (Category 3, 389 Acres). This is the only known golden eagle nesting location in the STSA at the present time. Others undoubtedly exist, although they have not been documented. To protect the immediate nesting/breeding area, a 0.50 square-mile area has been recommended for category 3 designation.

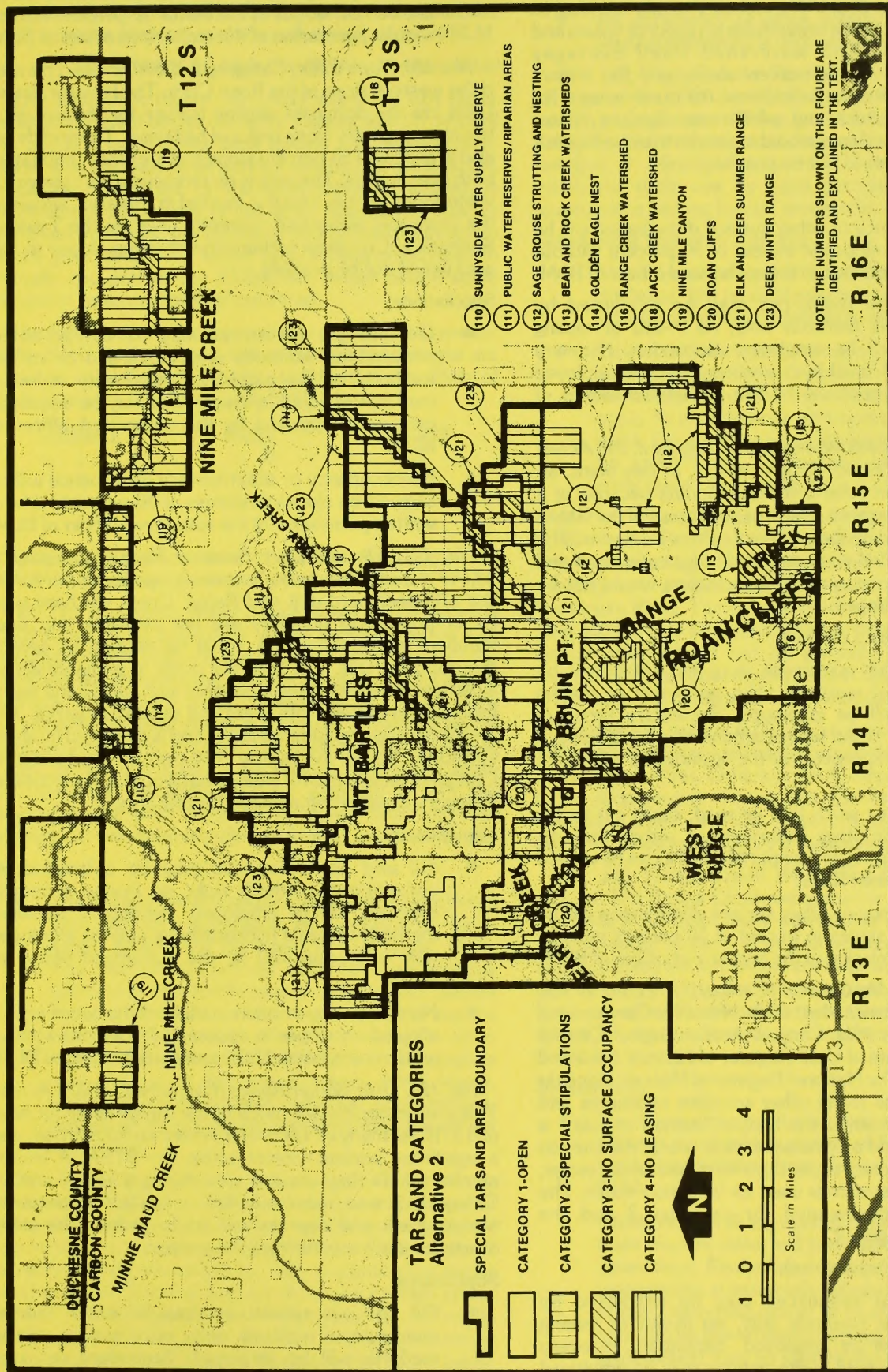


FIGURE 2-8
ALTERNATIVE 2, SUNNYSIDE AND VICINITY STSA
(SOUTHERN PORTION)

No. 116, Range Creek Watershed (Category 2, 1,442 Acres). The Range Creek Watershed is nearly identical to the Bear and Rock creek watersheds in resource values and erosion hazard. The watershed itself averages approximately 80- to 100-percent slope, and the stream supports a trout fishery. In addition, the creek is used for irrigation and livestock and wildlife use. Surface disturbance on the steep slopes would create an erosion hazard, and reclamation would not be possible.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.
- Oil and gas resources may be extracted by conventional methods only; no in-situ or mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of BLM.

No. 118, Jack Creek Watershed (Category 2, 946 Acres; Category 3, 320 Acres). Jack Creek is, at this point, an intermittent stream subject to flashflooding because of a large, steep drainage area. The area is also part of the Green River corridor used by thousands of rafters each year. The immediate watershed is recommended for category 3 and the remainder for category 2. Reclamation would not be possible on steep slopes.

Stipulations (category 2 areas):

- Oil and gas resources may be extracted by conventional methods only; no in-situ or mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of BLM.
- No access or work trail or road, earth cut or fill, structure or other improvement, other than an active drilling rig, will be permitted if it can be viewed from the Green River.
- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.

No. 119, Nine Mile Canyon (Category 2, 11,697 Acres; Category 3, 799 Acres). Most of the Nine Mile Canyon area is within the Nine Mile Canyon Archaeological District which is on the State of Utah Register of Historic Sites and was nominated to the National Register of Historic Places in 1974. The area has many other sensitive resources and environmental concerns: the canyon bottom contains a major floodplain and a principal access route; the canyon walls exceed 50-percent slope; the area is deer winter range; and the perennial stream is used for irrigation water. The floodplain is recommended for category 3 and the remainder for category 2.

Stipulations (category 2 areas):

- Oil and gas resources may be extracted by conventional methods only, no in-situ or mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of BLM.

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.

No. 120, Roan Cliffs (Category 2, 3,840 acres). This area is the western slope of the Roan Cliffs. The Roan or Brown Cliffs are the dominant skyline feature for thousands of travelers each day along regional highways. These cliffs are also in excess of 50-percent slope and are winter habitat for both deer and elk. The area is recommended as category 2. Whitmore Canyon, which is located in this area, serves as the municipal watershed currently used by the Town of Sunnyside. Complete reclamation of steep slopes in this area would not be possible.

Stipulations:

- Oil and gas resources may be extracted by conventional methods only; no in-situ or mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of BLM.
- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.

No. 121, Elk and Deer Summer Range (Category 2, 18,045 Acres). This area summers a significant portion of the 27B deer herd unit and Range Creek elk herd unit. Exact population numbers are not available, but deer numbers within the STSA could be as high as several thousand animals. The summer range is primarily above 8,000 feet in elevation and is covered with spruce and aspen forests interspersed with grass and sagebrush parks. The area is high quality summer range and is dissected by steep canyons, some averaging 100-percent sideslopes. Complete reclamation of steep areas would not be possible. Category 2 was recommended for this area.

Stipulations:

- Oil and gas resources may be extracted by conventional methods only; no in-situ or mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of BLM.
- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.

No. 123, Deer Winter Range (Category 2, 11,615 Acres). This area encompasses much of the winter range for herd unit 27B. As many as 4,000 deer winter within this unit, and a significant portion winters within the STSA. A limited number of elk may use the area during a severe winter. Category 2 was recommended to reduce impacts to wintering elk and deer as well as to protect the steep drainages and canyons from soil erosion.

Stipulations:

- Oil and gas resources may be extracted by conventional methods only, no in-situ or mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of BLM.

SUNNYSIDE AND VICINITY STSA (SOUTHERN)

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.

Alternative 3, Multiple Use (Preferred Alternative)

This alternative differs from Alternative 2 in two major aspects: (1) there are no category 1 areas; and (2) more of the STSA is open to tar sand leasing and development. Under this alternative, all surface mining and reclamation would be concurrent or the area disturbed limited. A maximum of 25 percent of any given lease area could be disturbed from mining activities or be in partial reclamation at any given time. This would allow mining possibilities in virtually any part of the STSA, but would assure some mitigation to environmental concerns.

The following lists the approximate acreage and percent of the STSA in the various categories. All percentages are based on total Federal acreage, exclusive of any State of Utah or private inholdings in the STSA.

Category	Acrees	Percent
1	0	0
2	67,269	90
3	7,641	10
4	0	0

Following are descriptions of specific areas within the STSA. The numbers given are keyed to Figure 2-9.

No. 110, Sunnyside Water Supply Reserve (Category 2, 2,400 Acres). The Sunnyside Water Supply Reserve was established in 1921 with the passage of PL-294 to protect the municipal watershed of the Town of Sunnyside. The area is partially withdrawn from mineral entry. The entire watershed is on steep slopes in excess of 50 percent and is highly susceptible to erosion. The principal stream, Range Creek, supports a quality trout stream. Watershed areas are, therefore, recommended for category 2 with the stipulation that zero discharge of water, sediment, and potential contaminants be allowed from any disturbed area.

Stipulation:

- The lands under this lease in (legal subdivision) have been formally designated as a municipal water supply reserve for the Town of Sunnyside, Utah. Any surface-disturbing activity shall require approval of both the Secretary of the Interior and the Town of Sunnyside prior to entry upon the surface estate. Any approved exploration, mining, or other surface disturbance shall be subject to complete containment of any runoff water, mine waste, sediment, or any other potential contaminant. Discharge of any type from any disturbed site will not be allowed.

No. 111, Public Water Reserves/Riparian Areas (Category 3, 3,615 Acres). These areas are the immediate watershed and floodplains of perennial and significant intermittent streams within the STSA. Much of these category 3 areas have been formally designated as public water reserves. These drainages all contain riparian areas. Some of the drainages support trout populations. Activity in these areas would create erosion and sedimentation hazards, as well as a potential for dewatering of the public water reserves.

Stipulation:

- No occupancy or other activity on the surface of (legal subdivision) is allowed under this lease.

No. 112, Sage Grouse Strutting and Nesting Grounds (Category 2, 1,758 Acres; Category 3, 478 Acres). The known sage grouse strutting grounds have been placed in category 3, with the surrounding nesting habitat placed in category 2. Mining activity on strutting grounds would eliminate their use by sage grouse; activity in the surrounding nesting habitat would affect nesting success.

Stipulations (category 2 areas):

- No surface mining of tar sand deposits is allowed on this lease. The tar sand may be extracted by in-situ or underground mining methods only.
- To protect nesting sage grouse, exploration, drilling, and other development activity will be allowed only from June 16 to March 31. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

No. 113, Bear and Rock Creek Watersheds (Category 3, 1,960 Acres). Bear and Rock creeks are two of the more important drainages found within the STSA. Rock Creek is a quality trout stream used by thousands of visitors floating the Green River. The watershed of both streams averages near 100-percent slope and is highly susceptible to erosion. Reclamation would not be possible on steep slopes; therefore, steep canyons and stream floodplains have been included in the category 3 recommendation.

No. 114, Golden Eagle Nest (Category 3, 389 Acres). This is the only known golden eagle nesting location in the STSA at the present time. Others undoubtedly exist, but have not been documented. To protect the immediate nesting/breeding area, a 0.50 square-mile area has been recommended for category 3 designation.

No. 116, Range Creek Watershed (Category 2, 1,442 Acres). The Range Creek watershed is nearly identical to the Bear and Rock Creek watersheds in resource values and erosion hazard. The watershed itself averages approximately 80- to 100-percent slope and supports a trout fishery. In addition, the creek is used for irrigation and livestock water. Surface disturbance on steep slopes would create an erosion hazard, and reclamation would not be possible.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission from the authorized officer of BLM.
- No more than 25 percent of the surface area of this lease may be disturbed from surface mining at any given time. Reclamation must be completed and revegetation substantially advanced to the approval of the authorized officer of BLM before additional area can be disturbed by mining. Exceptions to this requirement may be specifically authorized in writing by the authorized officer of BLM.

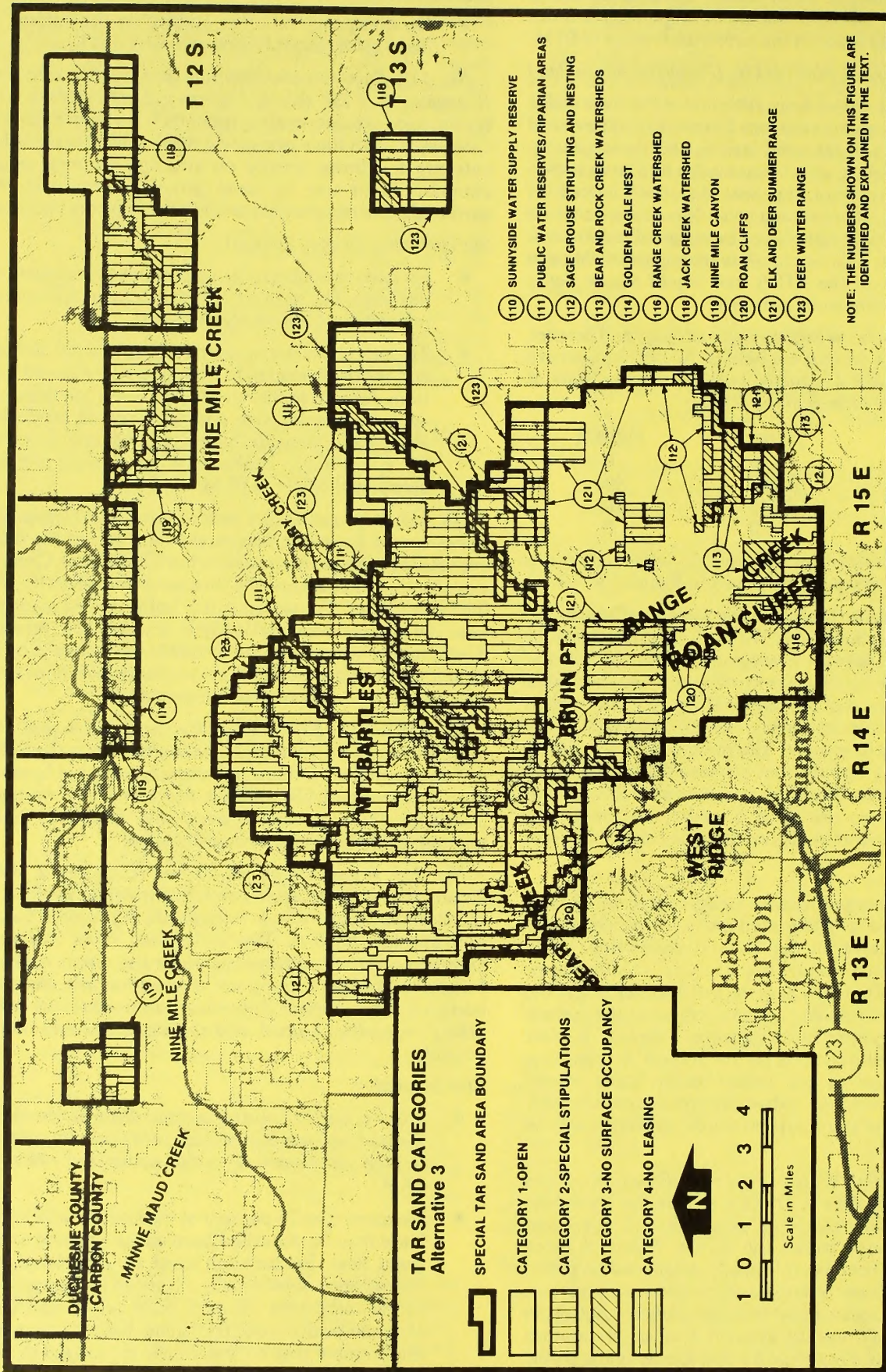


FIGURE 2-9
ALTERNATIVE 3, SUNNYSIDE AND VICINITY STSA
(SOUTHERN PORTION)

SUNNYSIDE AND VICINITY STSA (SOUTHERN)

- To protect important aquifers, all surface and in-situ mining must be preceded by complete hydrological testing and evaluation as specified by the authorized officer of BLM. Any loss of springs or reduction in perennial streamflow will be fully mitigated with an equal quantity and quality, as specified by the authorized officer of BLM.

No. 118, Jack Creek Watershed (Category 2, 866 Acres; Category 3, 400 Acres). Jack Creek is, at this point, an intermittent stream subject to flashflooding because of a large, steep drainage area. The area is also part of the Green River corridor used by thousands of rafters each year. The immediate watershed is recommended for category 3 and the remainder for category 2. Reclamation would not be possible on the steep slopes.

Stipulations (category 2 areas):

- No more than 25 percent of the surface area of this lease may be disturbed from surface mining at any given time. Reclamation must be completed and revegetation substantially advanced to the approval of the authorized officer of BLM before additional area can be disturbed by mining. Exceptions to this requirement may be specifically authorized in writing by the authorized officer of BLM.
- No access or work trail or road, earth cut or fill, structure or other improvement, other than an active drilling rig, will be permitted if it can be viewed from the Green River.
- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.

No. 119, Nine Mile Canyon (Category 2, 11,697 Acres; Category 3, 799 Acres). Most of the Nine Mile Canyon area is within the Nine Mile Canyon Archaeological District, which is on the State of Utah Register of Historical Sites and was nominated to the National Register of Historic Places in 1974. The area also has many other sensitive resources and environmental concerns: the canyon bottom contains a major floodplain and a principal access route; the canyon walls exceed 50-percent slopes; the area is deer winter range; and the stream is used for irrigation water. The floodplain is recommended for category 3 and the remainder for category 2.

Stipulations (category 2 areas):

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.
- No more than 25 percent of the surface area of this lease may be disturbed from surface mining at any given time. Reclamation must be completed and revegetation substantially advanced to the approval of the authorized officer of BLM before additional area can be disturbed by mining. Exceptions to this requirement may be specifically authorized in writing by the authorized officer of BLM.
- To protect important aquifers, all surface and in-situ mining must be preceded by complete hydrological testing and evaluation as specified by the authorized officer of BLM. Any loss of springs or reduction in perennial streamflow will be fully mitigated with an equal quantity and quality as specified by the authorized officer of BLM.

- To protect deer winter range, exploration, drilling, and other development activity will be allowed only from May 16 to October 31. This limitation does not apply to maintenance and operation of producing wells or mines. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

No. 120, Roan Cliffs (Category 2, 3,200 Acres). This area is the western slope of the Roan Cliffs. The Roan or Brown Cliffs are the dominant skyline feature for thousands of travelers each day along regional highways. These cliffs are also in excess of 50-percent slope and winter both deer and elk. A portion of the area, Whitmore Canyon, is the current municipal watershed for the Town of Sunnyside. The area is recommended as category 2.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission of the authorized officer of BLM.
- No more than 25 percent of the surface area of this lease may be disturbed from surface mining at any given time. Reclamation must be completed and revegetation substantially advanced to the approval of the authorized officer of BLM before additional area can be disturbed by mining. Exceptions to this requirement may be specifically authorized in writing by the authorized officer of BLM.
- To protect deer winter range, exploration, drilling, and other development activity will be allowed only from May 16 to October 31. This limitation does not apply to maintenance and operation of producing wells or mines. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

No. 121, Elk and Deer Summer Range (Category 2, 34,331 Acres) This area summers a significant portion of the UDWR-designated 27B deer herd unit and 27B Range Creek elk herd unit. Accurate population numbers are not available, but deer numbers within the STSA could be as high as several thousand animals. The summer range is primarily above 8,000 feet in elevation and is covered with spruce and aspen groves interspersed with grass and sagebrush parks. A vegetative community of special value is the aspen motts scattered throughout the summer range, which is high quality summer range.

In addition to the wildlife values, the entire area is thought to be underlain by areawide and local aquifers above the tar sand deposits. The area also exhibits a high erosion potential on steep slopes.

Stipulations:

- To protect important aquifers, all surface and in-situ mining must be preceded by complete hydrological testing and evaluation as specified by the the authorized officer of BLM. Any loss of springs or reduction in perennial streamflow will be fully mitigated with an equal quantity and quality as specified by the authorized officer of BLM.
- No occupancy or other surface disturbance of will be allowed on slopes in excess of 50 percent without written permission from the authorized officer of BLM.

CHAP 2: ALTERNATIVE EVALUATIONS

- No more than 25 percent of the surface area of this lease may be disturbed from surface mining at any given time. Reclamation must be completed and revegetation substantially advanced to the approval of the authorized officer of BLM before additional area can be disturbed by mining. Exceptions to this requirement may be specifically authorized in writing by the authorized officer of BLM.
- No surface mining will be allowed in aspen vegetative communities without off-site enhancement of similar vegetative communities of equal wildlife value. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.
- To protect important elk and deer summer range, exploration, drilling, and other development activity will be allowed only from July 16 through May 17. This limitation does not apply to maintenance and operation of producing wells or mines. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

No. 123, Deer Winter Range (Category 2, 11,575 Acres). This area encompasses much of the winter range for herd unit 27B. As many as 4,000 deer winter within this unit, and a significant portion winters within the STSA. A limited number of elk may winter in the area during a severe winter.

The area is thought to be underlain by important areawide aquifers. In addition, the area is dissected by numerous steep canyons with slopes in excess of 50 percent. To provide minimal protection of these values, the following stipulations are recommended.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission from the authorized officer of BLM.
- No more than 25 percent of the surface area of this lease may be disturbed from surface mining at any given time. Reclamation must be completed and revegetation substantially advanced to the approval of the authorized officer of BLM before additional area can be disturbed by mining. Exceptions to this requirement may be specifically authorized in writing by the authorized officer of BLM.
- To protect important aquifers, all surface and in-situ mining must be preceded by complete hydrological testing and evaluation as specified by the authorized officer of BLM. Any loss of springs or reduction in perennial streamflow will be fully mitigated with an equal quantity and quality as specified by the authorized officer of BLM.
- To protect deer summer range, exploration, drilling, or surface development activity will not be allowed from May 16 to October 31. This limitation does not apply to maintenance and operation of producing wells or mines. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

Alternative 4, Resource Protection

A wide range of categories and stipulations allowing for some level of tar sand development were considered in development of this alternative. It provides for realistic protection of special resource values, but does not exclude tar sand development.

The following lists the approximate acres and percent of the STSA in the various categories. All percentages are based on total Federal acreages, exclusive of any State of Utah or private inholdings.

Category	Acres	Percent
1	0	0
2	49,098	66
3	20,918	28
4	4,903	7

Sensitive areas within the STSA are displayed in Figure 2-10. Following are descriptions of each area and its stipulations. The numbers given are keyed to Figure 2-10.

No. 110, Sunnyside Water Supply Reserve (Category 4, 2,400 Acres). The Sunnyside Water Supply Reserve was established in 1921 with the passage of PL-294 to protect the municipal watershed of the Town of Sunnyside. The area is partially withdrawn from mineral entry. The entire watershed is on steep slopes in excess of 50 percent and is highly susceptible to erosion. The watershed is drained by Range Creek, which supports a quality trout fishery. The watershed is therefore recommended for category 4. (Note: Any conversion of existing leases within the watershed would be given a no surface occupancy stipulation. Prior leases in newly designated no lease areas must be recognized; however, this special stipulation would be enforced.)

No. 111, Public Water Reserves (Category 3, 2,439 Acres; Category 4, 1,581 Acres). These areas are the immediate watershed and floodplains of major perennial and intermittent streams within the STSA. Category 4 areas have been formally designated as public water reserves. These drainages all contain riparian areas. Some of the drainages support trout populations. Activity in these areas would create erosion and sedimentation hazards, as well as a potential for dewatering of the public water reserves.

No. 112, Sage Grouse Strutting and Nesting Grounds (Category 3, 2,236 Acres). The known sage grouse strutting and nesting habitat has been placed in category 3. Mining activity on strutting grounds would eliminate their use by sage grouse; activity in the surrounding nesting habitat would affect nesting success.

No. 113, Bear and Rock Creek Watersheds (Category 3, 1,560 Acres). Bear and Rock creeks are two of the more important drainages found within the STSA. Rock Creek is a quality trout stream used by thousands of visitors floating the Green River each year. The watershed of both streams averages near 100-percent slope and is highly susceptible to erosion. Reclamation would not be possible on such slopes. The steep canyons and stream floodplains have been included in the category 3 recommendation.

No. 114, Golden Eagle Nest (Category 3, 389 Acres). This is the only known golden eagle nesting location in the STSA at the present time. Others undoubtedly exist, but have not been documented. To protect the immediate nesting/-breeding area, a one-half square mile area has been

SUNNYSIDE AND VICINITY STSA (SOUTHERN)

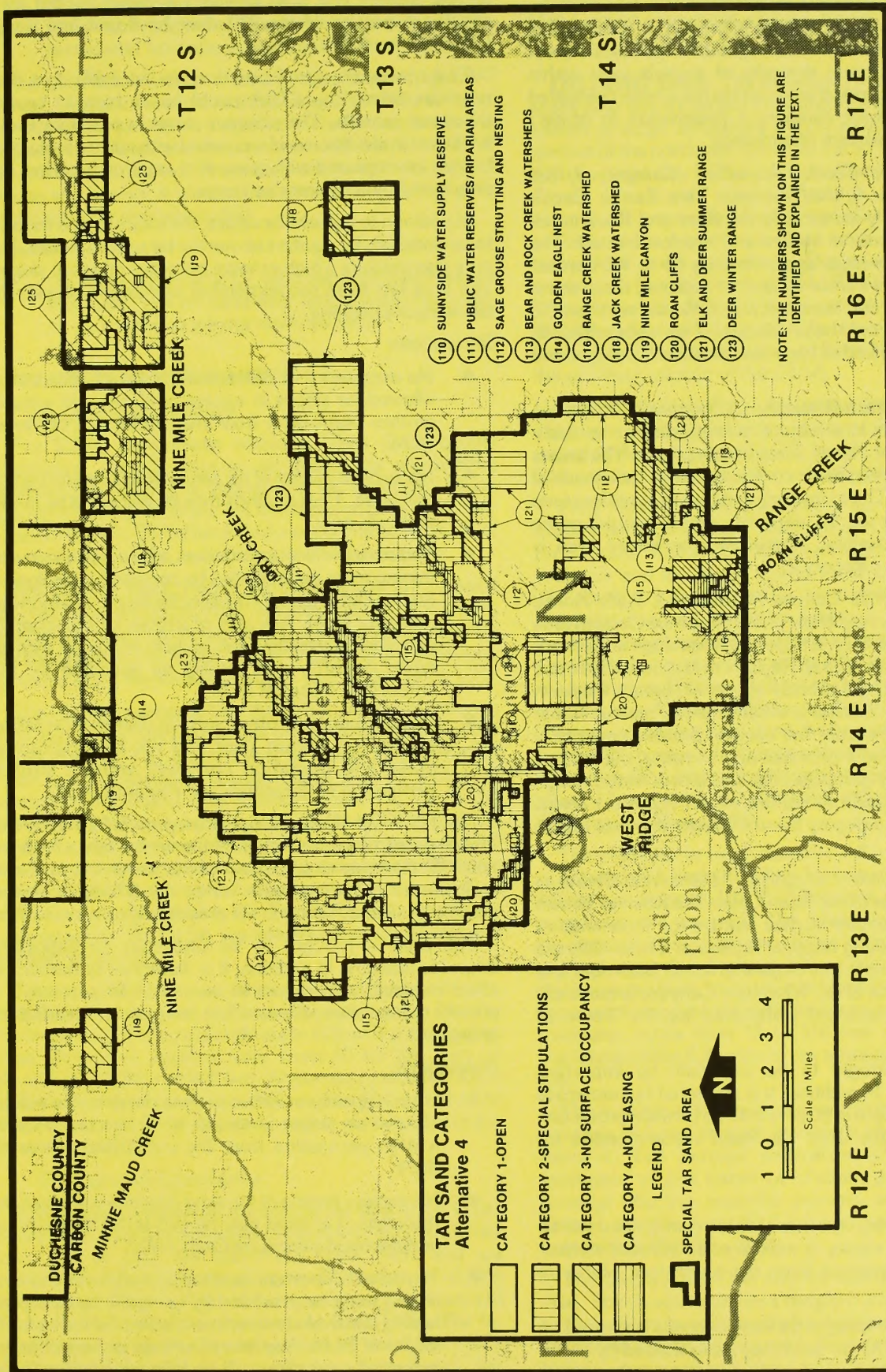


FIGURE 2-10
ALTERNATIVE 4
SUNNYSIDE AND VICINITY SPECIAL TAR SAND AREA
(SOUTHERN PORTION)

CHAP 2: ALTERNATIVE EVALUATIONS

recommended for category 3 designation.

No. 115, Aspen Communities (Category 3, 3,062 Acres; Category 4, 201 Acres). This vegetative type is the most productive and a great diversity of animals exist within aspen groves. The largest aspen areas have been delineated and recommended for category 3 designation to protect these areas from surface disturbance.

No. 116, Range Creek Watershed (Category 3, 880 Acres; Category 4, 201 Acres). The Range Creek watershed is nearly identical to the Bear and Rock creek watersheds in resource values and erosion hazard. The watershed itself averages approximately 80- to 100-percent slope and supports a trout fishery. In addition, the creek is used for irrigation and livestock water. Reclamation would not be possible on these slopes. The watershed is, therefore, recommended for a combination of categories 3 and 4.

No. 118, Jack Creek Watershed (Category 3, 793 Acres). Jack Creek is an intermittent stream subject to flash-flooding because of a large, steep drainage area. The area is also part of the Green River corridor used by thousands of rafters each year. The immediate watershed contains steep slopes in excess of 50 percent, which would make reclamation impossible. Therefore, the entire area is recommended for category 3.

No. 119, Nine Mile Canyon (Category 3, 9,559 Acres; Category 4, 520 Acres). Most of the Nine Mile Canyon area is within the Nine Mile Canyon Archaeological District, which is on the State of Utah Register of Historical Sites and was nominated to the National Register of Historic Places in 1974. The area also has many other sensitive resources and environmental concerns: the canyon bottom contains a major floodplain and a principal access route, the canyon walls exceed 50-percent slope; the area is deer winter range; and the stream is used for irrigation water. The entire area is recommended for category 3 and 4 designation (see Figure 2-10).

No. 120, Roan Cliffs (Category 2, 3,200 Acres). This area is the western slope of the Roan Cliffs. The Roan or Brown Cliffs are the dominant skyline feature for thousands of travelers per day along regional highways. These cliffs are also in excess of 50-percent slope and winter both deer and elk. A portion of the area, Whitmore Canyon, is currently being used as municipal watershed by the Town of Sunnyside.

The area is thought to be underlain by important areawide aquifers. In addition, it is dissected by numerous steep slopes in excess of 50 percent. To provide protection of these values, the area has been recommended for category 2.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission from the authorized officer of BLM.
- No surface mining of tar sand deposits is allowed on this lease. The tar sand may be extracted by in-situ methods only.

No. 121, Elk and Deer Summer Range (Category 2,

31,384 Acres). This area provides summer habitat for a significant portion of the 27B deer herd unit and Range Creek elk herd unit.

Exact population numbers are not available, but deer numbers within the STSA could be as high as several thousand animals. The summer range is primarily above 8,000 feet in elevation and is covered with spruce and aspen forests interspersed with grass and sagebrush parks. The area is high quality summer range.

In addition to the wildlife values, the entire area is thought to be underlain by aquifers above the tar sand deposits. The area also exhibits a high erosion potential on steep slopes. The area has been recommended as category 2 with the following stipulations.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission from the authorized officer of BLM.
- No surface mining of tar sand deposits is allowed on this lease. The tar sands may be extracted by in-situ methods only.
- To protect important aquifers, all surface and in-situ mining must be preceded by complete hydrological testing and evaluation as specified by the authorized officer of BLM. Any loss of springs or reduction in perennial streamflow will be fully mitigated with an equal quantity and quality as specified by the authorized officer of BLM.
- No occupancy or other surface disturbance will be allowed on known deer and elk fawning/calving areas and migration corridors without written permission of the authorized officer of BLM.

No. 123, Deer Winter Range (Category 2, 12,088 Acres). This area encompasses much of the winter range for herd unit 27B. As many as 4,000 deer winter within this unit, and a significant portion winters within the STSA. A limited number of elk may winter in the area during a severe winter.

The area is thought to be underlain by important areawide aquifers. In addition, it is dissected by numerous steep canyons with slopes in excess of 50 percent. To protect these values, the area has been recommended for category 2.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 50 percent without written permission from the authorized officer of BLM.
- No surface mining of tar sand deposits is allowed on this lease. Tar sand may be extracted by in-situ or underground mining methods only.
- To protect important aquifers, all surface and in-situ mining must be preceded by complete hydrological testing and evaluation as specified by the authorized officer of BLM. Any loss of springs or reduction in perennial streamflow will be fully mitigated with an equal quantity and quality as specified by the authorized officer of BLM.

SUNNYSIDE AND VICINITY STSA (SOUTHERN)

- No occupancy or other surface disturbance will be allowed on known deer and elk fawning/calving areas and migration corridors without written permission from the authorized officer of BLM.

No. 125, Nine Mile Deer Winter Range (Category 2, 2,417 Acres). This area and the surrounding Nine Mile Canyon provide winter habitat for a significant number of deer in the 27B herd unit. Exact numbers are not available, but several hundred are estimated. The area is primarily mesa tops of pinyon and juniper. It has been recommended for category 2 with the following stipulation.

Stipulation:

- No surface mining of tar sand deposits is allowed on this lease. The tar sand may be extracted by in-situ or underground mining methods only.

AFFECTED ENVIRONMENT

Air Quality and Climate

The STSA is currently within a Class II air quality designation. Specific data on air quality are unavailable; however, the quality is thought to be excellent. Major sources of air pollution are not found within or immediately adjacent to the STSA. Natural sources of pollution, such as airborne particulates, are present in small quantities.

The cities of Price, Helper, and Sunnyside are regional sources of air pollution; other sources are the Huntington and Hunter coal-fired power plants, located approximately 45 miles west of the STSA. Some emissions are produced by traffic along Regional Highway 6 and 10 and along I-70.

The climate regimes within the STSA are varied, ranging from arid at the lower elevations to humid over much of the higher plateau. The eastern portion below approximately 7,000 feet in elevation receives about 6 to 10 inches of precipitation annually. The frost-free season is 115 to 165 days. Precipitation occurs principally as snow during the winter months from fronts of Pacific origin. Summer rainfall most commonly occurs from cyclonic thunderstorms as the weather patterns change to bring in moist air from the Gulf of Mexico as well as from the Pacific Ocean. All climate regimes within the STSA are influenced by these regional weather patterns.

Total precipitation amounts increase from approximately 14 to 30 inches per year as the elevation increases. Most of the forest areas and grasslands are in this wide precipitation zone. Frost-free seasons vary from 50 to 100 days at elevations of 7,500 to 8,500 feet. Above approximately 8,500 feet, the frost-free season can be less than 60 days. Most of the precipitation occurring at the higher elevations is in the form of snowfall.

Geology and Topography

The STSA is located on the southwest limb of the Uinta Basin. Strata dip 3 to 6 degrees to the north/northeast. The lower set of cliffs are called the Book Cliffs and are composed of Cretaceous sediments. The upper set of cliffs are the Roan (Brown) Cliffs of Tertiary strata. The dissected Tavaputs Plateau are northeast of the Roan Cliffs. The tar sand crops out on the southwest face of the Roan Cliffs. Outcrops also occur in the canyons that dissect the Plateau. The topography of the STSA is rugged, and canyon sides exceed 100-percent slope in many places.

Elevations range from 10,285 feet at Bruin Point (Township 13 South, Range 14 East, Sec. 33) to 5,200 feet along Nine Mile Canyon (Township 12 East, Range 16 East, Sec. 2).

Minerals

OIL AND GAS: The principal oil- and gas-producing areas near the STSA are the Peters Point and Jack Creek known geologic structures (KGS) which occur in a small portion of the northeast corner of the STSA. The oil and gas wells in these two KGSs produce from zones in the basal Green River and upper Wasatch formations. The commercial accumulation of oil and gas occurs in lenticular sandstones in impervious shale with oil and gas being trapped in small enclosures. During the 30 years that production has occurred, about 130,000 barrels of oil and 2.5 million cubic feet of natural gas have been produced. Smaller and less productive KGSs also occur in portions of the STSA. The Stone Cabin and Nine Mile KGSs occur in the northern section of the STSA.

The potential for oil and gas production from the STSA is unknown, but is considered favorable because it is underlain by more than 12,000 feet of sedimentary strata. Some of these strata produce oil and gas in adjacent areas.

TAR SAND: The Sunnyside tar sand resource is located within the upper Wasatch and lower Green River formations. Considerable intertonguing of the fluvial Wasatch and lacustrine Green River formations occurs. The beds of the Wasatch formation are extremely discontinuous and lenticular, whereas beds of the lower Green River are relatively uniform and persistent. The most significant tar sand occurs in the Wasatch. Individual beds are as thick as 350 feet. Many of the bitumen impregnations occur in broad channels of sand in the underlying shales and limestones. Many sandstone beds contain less bitumen toward the base, and bitumen content often changes along the strike. The bitumen content ranges from very little to about 13 percent by weight (54.6 gallons per cubic yard) (Holmes and Page, 1956).

The estimated in-place resource in the Sunnyside deposit is between 3.5 and 4.0 billion barrels of oil, of which 1.25 billion are measured, 1.75 billion are indicated, and the remainder are inferred. The areal extent of measured resources is 35 square miles; there is an indicated resource of 90 square miles. Three to 12 pay zones 5 or more feet in thickness are likely to be encountered at any one location in the area of measured or indicated areal resources. The total thickness varies from 15 to 550 feet thick. Overburden thickness within 0.25 mile of the outcrop is as much as 500 feet.

The average sulfur content of extracted oil is .55 percent. Average bitumen content by weight of 24 analyses is 8.97 percent. Ten percent saturation of the rock is the equivalent of one barrel of bitumen per 2 tons of rock. Average effective reservoir porosity and permeability of several samples were 28.5 percent and 365 millidarcies, respectively (Ritzma, 1979).

The Sunnyside STSA may be thought of as a fossil oil field. The deposit was once deeply buried but was brought to the surface by erosion. As the overburden was removed, gases and lighter oils escaped; the heavier, more resistant bitumen remained and forms today's tar sand.

OIL SHALE: The principal oil shales of the Uintah Basin occur in the Green River formation. The richest and

thickest oil shale bed in the Green River formation is the Mahogany member. Maximum outcrop thickness of the Mahogany is about 8 feet (Cashion, 1964). Presently, it is impossible to predict the average thickness and grade of oil shale that will prove suitable for retorting. However, 15 feet is presently considered the minimum thickness. Advancements in technology and changing economic factors may make presently uneconomic deposits profitable for development in the future.

No published data concerning oil shale resources of Carbon County are known. However, about 250 square miles of the northeastern portion of the County are thought to contain oil shale beds greater than 15 feet thick. The quality improves to the northeast. A drill hole in extreme northeastern Carbon County penetrated 54 feet of oil shale containing more than 15 gallons of shale oil per ton, with 13 feet containing about 30 gallons per ton (Cashion, 1959).

Oil shale deposits under the jurisdiction of the USDI are under withdrawal. Executive Order 5327 of April 15, 1930 directed that, subject to valid existing rights, oil shale deposits be temporarily withdrawn from lease or other disposal. Public Land Order 4522 (September 13, 1968) supplemented Executive Order 5327 by withdrawing oil shale lands in Colorado, Utah, and Wyoming from appropriation under mining laws relating to metalliferous minerals and from sodium leasing. Executive Order 6016 (February 6, 1933) allows oil and gas leases to be issued within oil shale withdrawals. By Public Land Order 2795 of October 26, 1962, leases may be issued for tar sand.

COAL: The STSA overlaps with the Book Cliffs Known Recoverable Coal Resource Area (KRCRA). The coal occurs in the Blackhawk formation of Cretaceous age. The uppermost coal seam is at least 1,200 feet below the tar sands.

Soils

The soils in the STSA are shallow to deep and well drained on moderate to steep slopes.

Vegetation

Detailed vegetation maps and descriptions, which are based on a soil-vegetation inventory method (SVIM) survey completed in 1978, are available at the BLM's Price Office. Complex and varied vegetation types are summarized as follows:

Riparian vegetation is found along the streams of most of the canyons within the STSA and is characterized by dense growth of hydrophilic plants. Riparian zones are some of the most productive vegetation types for forage and wildlife diversity. These zones serve to stabilize streambanks, affect the quantity and quality of stream water, and provide important wildlife habitat; they are also highly valued by recreationists.

The aspen type occurs in riparian areas as seral communities and as climax communities in high mountain loamy soils. Approximately 3,000 acres of the aspen climax community are found within the STSA. Aspen-type vegetation is very productive in terms of livestock and wildlife forage, wildlife habitat, and recreational opportunities. Aspen types hold snow on watersheds and provide a diverse understory of grasses, forbs, and browse.

Wet meadows produce more annual growth per acre

than any other vegetation type in the STSA. Through the SVIM survey, approximately 200 acres of wet meadows were mapped within the STSA. Undoubtedly the total area is larger, but these additional areas are less than 4 acres and are too small to map. Wet meadows provide valuable wildlife diversity and are important to watershed and water quality.

Other vegetation types include mountain browse, sagebrush-grass, salt shrub, pinyon-juniper woodland, and coniferous forest. Mountain browse vegetation-type areas include shrubs, forbs, and grasses that provide forage to livestock and crucial habitat to wildlife. The sagebrush-grass type, which has an overstory of sagebrush with grasses as the key understory plant, is typically found on benches and plateau areas. The salt-shrub vegetation type is found at lower elevations in the extreme northeastern portion of the STSA. The pinyon-juniper woodland type occurs between the semi-desert and mountain zones and is characterized by Utah juniper and pinyon pine. The coniferous forest type is dominated by ponderosa pine, Douglas fir, white fir, Engleman spruce, or subalpine fir.

THREATENED OR ENDANGERED SPECIES:

Federally listed threatened or endangered plant species are not known to occur in the Moab District portion of the STSA. However, Uinta Basin hookless cactus *Sclerocactus glaucus* has been located immediately to the north. This cactus is found on gravelly hills in the salt-shrub zone and may be present within the STSA.

Water Resources

SURFACE WATER: The STSA is in the Green River drainage of the Colorado River basin. Major subdrainages include the Price River, Range Creek, and Nine Mile Creek. Water quality is generally good in the upper watersheds of the STSA. Primary water uses are for livestock and wildlife, mineral exploration and extraction, domestic use, and for watershed values. Downstream uses include municipal, industrial, and irrigation for agriculture. Numerous public water reserves are located in the perennial sections of the major streams found in the STSA.

GROUNDWATER: Numerous springs (four of which are developed for livestock use) and seeps are located throughout the STSA. They are found isolated on hill slopes and along stream courses. This groundwater forms the base flow for perennial streams. Many of the springs are designated public water reserves.

Shallow consolidated and unconsolidated geologic deposits serve as reservoirs or aquifers for this underground water. The Parachute Creek member of the Green River formation is thought to be the aquifer for much of the area underlain by tar sand. Local and areawide water flow direction and properties of the aquifers are not known. Groundwater quality is thought to be good, although specific data are lacking.

WATERSHED: Soil, vegetation, and slope determine the quality of the watershed within the STSA. The higher elevations above 8,000 feet provide for good ground cover with dense forests and grassy meadows. Generally, the higher elevation watersheds are in good condition with low background erosion rates. Vegetation densities are less at lower elevations with more exposed soil. Therefore, natural erosion rates are much greater, especially on steep slopes.

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Wildlife

The affected area is inhabited by 348 terrestrial and 7 aquatic species. Of the 348 terrestrial species, there are 246 bird, 82 mammal, and 20 reptile and amphibian species (Day, 1978). Seven fish species were documented in Nine Mile Creek and Range Creek (USDI, BLM, 1982).

The entire STSA lies in mule deer herd unit 27B and the Range Creek elk herd unit; a large percentage of the summer range for these herd units is within the STSA. Mule deer populations are presently below prior stable levels of the 1960s; however, the population trend appears to be increasing. Elk in the Range Creek herd unit are becoming established after being absent since the early 1900's. The population is estimated to be 40 to 60 animals and appears to be increasing. A transplant of additional elk into this herd has been proposed: UDWR also recognizes the location of the Range Creek elk herd as a potential transplant site. Rocky Mountain bighorn sheep occupy the eastern portion of the STSA. They were reintroduced into the area in 1972. Moose appear to be occupying the limited habitat available in headwaters of Dry Canyon, Range Creek, and the right fork of Whitmore Canyon.

Upland game birds present in the affected area include sage grouse, blue and ruffed grouse, and chukar partridge. Six sage grouse strutting grounds and associated nesting/brooding areas occur in the STSA. Bird count data on strutting grounds are insufficient to determine population trends in the STSA. However, other sage grouse populations in the Carbon County area have shown a decline in population trend.

Chukar partridge populations appear stable, with normal yearly fluctuations resulting from climatic conditions. Little is known about blue and ruffed grouse population trends in the STSA.

Migratory game birds present in the area include mourning dove and band-tailed pigeon. Dove are common in the lower elevations during the summer. Nine Mile, Range Creek, and other perennial and intermittent streams provide restricted nesting and loafing habitat for waterfowl.

Golden eagles and red-tailed hawks nest in the affected area. Several other species (prairie falcon, sharp-shinned hawk, and several species of owls) have been nesting near the STSA. A large number of additional raptor species (i.e., rough-legged hawk, bald eagle, peregrine falcon, and ferruginous hawk) use the area during the winter.

Nine Mile Creek, the north fork of Rock Creek, Bear Canyon Creek, Flat Canyon Creek, and Range Creek (located just outside the southern STSA boundary) all contain good trout fisheries. Nine Mile supports a limited warm-water fishery and is generally in poor condition. The other three streams support a cold-water fishery and are in good condition in their upper reaches. Flat Canyon Creek has been identified as potential habitat for pure Colorado cutthroat, a sensitive species proposed for Federal designation as threatened or endangered.

THREATENED AND ENDANGERED SPECIES:

Two endangered species, the peregrine falcon and the bald eagle, inhabit the STSA. The bald eagle is a winter resident and a migrant during fall and spring. Concentration use areas are not known or suspected to be present.

The peregrine falcon is a winter resident and spring and fall migrant. The peregrine is also a potential nester in the STSA. Known suitable nesting habitats are located in Flat Canyon and the north fork of Rock Creek. Inventories are needed to identify other suitable habitats or to substantiate nesting in these areas.

UNIQUE AND LIMITED HIGH VALUE HABITATS: The habitats of extreme importance to a large diversity and/or density of wildlife species present in the STSA include riparian and aspen communities. Riparian communities are associated with perennial and intermittent streams. A combination of available water, lush and palatable vegetative growth, diversified cover types, modified microclimate, increased edge effect, and generally accessible terrain make the riparian community of extreme high value (Thomas, 1979).

Aspen has also been identified as supporting an exceptionally large diversity of wildlife, particularly nongame birds (USDI, BLM, 1982; Winternitz, 1980). Aspen communities are also invaluable for providing forage and cover in the summer and fall for big game species.

Livestock and Agriculture

The public surface estate of the STSA is included in grazing allotments. Sixteen livestock operations are permitted to use the Federal range within the STSA for livestock grazing. The following table summarizes data for livestock grazing in the STSA. This grazing use totals 13,840 AUMs. One corral, approximately 5 miles of fence, and four developed springs are located within the STSA.

Allotment Name	No. of Operators	Kind of Livestock	No. of AUMs (Active Preference)	Season of Use	Percent of Allotment Within STSA
Cow Canyon	4	Cattle	95	6-1/10-15	40
Sheep Canyon	6	Cattle	696	5-1/10-20	80
Green River	1	Cattle	8,584	1-1/12-31	40
Rock Creek	1	Cattle	1,594	3-1/10-31	5
				10-1/10-15	55
Dry Canyon	1	Cattle	890	5-1/6-30	50
Stone Cabin	1	Cattle	1,625	5-1/9-30	15
Sulfur Canyon	1	Cattle	336	5-1/10-15	
		Horses			
Max Canyon	1	Cattle	20	5-1/11-30	65

Source: USDI, BLM, 1982.

No agricultural uses have occurred on BLM land in the STSA. Private ranches are located along Range Creek and in Nine Mile Canyon.

WILD HORSES: Approximately 25 wild horses occupy the eastern portion of the STSA. BLM estimates that 150 animals could be supported.

Visual Resources

Portions of the STSA fall in VRM Classes II, III, IV, and V. Visual resources are evaluated based on the basic visual elements in a landscape--form, line, color, and texture. The following is a summary of VRM classes, management guidelines, and percentage of the STSA.

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VRM Class	Management Guidelines	Percentage of STSA
II	Changes in the basic elements caused by an activity should not be evident in characteristic landscape. They may be seen but must not attract attention.	60
III	Contrasts to the basic elements caused by an activity are evident but should remain subordinate to the existing landscape.	24
IV	Any contrast can attract attention and be a dominant feature of the landscape, but it should repeat the basic elements.	15
V	These areas cannot fit any of the above classes because of substantial modification of and contrast with the characteristic landscape.	<1

The western escarpments and mountains of the STSA are highly visible to travelers on Highways 6, 10, and 191 and to residents of Price and Wellington. The cumulative total of vehicles per year on stretches of highway where the STSA is readily visible is 766,500 (UDOT, 1979).

Cultural Resources

The proposed Nine Mile Canyon Archaeological District, located in the northern portion of STSA, is the only portion where known archaeological sites have been documented. The district contains a variety of site types including rock art (both petroglyph and pictograph), dry masonry fortresses, pit houses, several styles of granaries, and caves or overhangs used for shelters.

A concentration of archaeological sites in the San Rafael Fremont area is present in this district, which includes over 100 rock art sites. In addition, numerous dwelling sites and structural remains are known: a formal survey would probably reveal many more. The Dry Canyon drainage has been surveyed and contains 21 sites in a 6-mile segment. Nine Mile Canyon and major tributaries probably contain similar concentrations.

Cultural resources are not well documented throughout most of the STSA. A portion of Nine Mile Canyon included in the archaeological district was nominated to the National Register of Historic Places in February 1974.

The canyon bottom contains several ranch headquarters and has historically been used for livestock grazing and agriculture. Nine Mile Canyon also contains structures and points of interest related to its use as a wagon freight route between Price and Myton. The road was constructed in 1886 by soldiers from Fort Duchesne to move goods and supplies from the railway in Price to the Uinta Basin. After 1889, as gilsonite mines were established in the Uinta Basin, the canyon continued to be a freight route from the Uinta Basin to Price. The freight route remained in use until a better road was established along Willow Creek and through Indian Canyon to Duchesne.

Recreation

Developed recreation sites are not located within the STSA. However, the Bruin Point and Nine Mile Canyon areas are extensively used for recreation. Other dispersed recreation occurs throughout the STSA and includes sightseeing, picnicking, camping, and hunting.

BRUIN VIEW AREA: Recreation facilities have not been built in this area, nor has it been withdrawn from development under the mineral leasing laws. The area provides an excellent view of nearby and distant canyons and mountains and the San Rafael Swell. Recreational use occurs in the form of picnicking, sightseeing, camping, fishing, and hunting. The area receives an estimated 1,000 visits per year. Rock Creek and Range Creek receive the majority of the STSA's fishing use.

NINE MILE CANYON: Recreational use in Nine Mile Canyon is primarily for picnicking and historical/archaeological sightseeing. An estimated 1,200 to 1,800 recreation-related visits occur each year. The College of Eastern Utah Historical Museum estimated that 4,000 interpretive pamphlets were distributed in 1981.

HUNTING: Nearly all hunting within the STSA is for deer. In 1982, 1,726 hunters were afield within herd unit 27B, and about 80 percent of those were in the area of the STSA (Day, 1981). Most of the hunting occurs in this area because good public access to the summer range is available. Small numbers of hunters also use private lands not accessible to the general public. Sage grouse were hunted in the area until 1980. Hunters afield in Carbon County for 1979 were 1,470, and about 150 of these hunted in the STSA (UDWR, 1980).

SIGHTSEEING: The remains of the tar sand tramway (cable car) and mine in Water Canyon, constructed in 1929, provide sightseeing opportunities. The site is on private surface above Sunnyside, except for approximately 670 feet of the tramway. This site is of interest because of the uniqueness of the operation. Tar sand here was mined and used for paving roads without any processing.

The area above Book Cliffs was identified as high quality scenic viewing in the Price River Planning Unit because of the size and variety of landforms and the vegetation present. Tributary canyons to Desolation Canyon (i.e., Jack Creek, Flat Canyon and Rock Creek) were identified as the highest quality sightseeing locations in the Price River Resource Area, based on landforms, uniqueness, color, water, and vegetation. Slopes generally exceed 100 percent. Color contrasts between the vegetation and the reds and tans of the rocks and soils are dramatic and numerous. Creeks in the canyon bottoms flow over falls and plunge pools amid riparian vegetation. Recreational use of the STSA exclusively for sightseeing is limited at this time, although horseback outfitting from nearby lodges has begun. Some of this outfitting is in conjunction with river outfitting businesses. A few recreationists from the Green River walk to the upper portions of tributary canyons from Desolation Canyon to sightsee.

Wilderness

Four small areas on the eastern side of the STSA overlap BLM lands under wilderness review. The areas fall within the Desolation Canyon wilderness inventory unit (UT-060-068A). A part of the unit has been designated as a WSA of 250,750 acres, which affects three areas of the STSA. The Interior Board of Land Appeals

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(IBLA) remanded part of the remaining inventory unit, 57,000 acres, to the BLM for further analysis. Part of the area remanded includes Jack Creek drainage and Cedar Ridge areas, which affects two areas of the STSA.

Only a small fraction of either the WSA or remanded inventory unit overlaps the STSA. The percentage of the STSA involved is also small. Two portions of the STSA overlap the WSA. Three discrete areas totaling 620 acres are affected (180,160 and 280 acres, respectively). An additional acreage overlaps the remanded inventory unit, totaling 2,620 acres in two discrete parcels (240 and 2,380 acres, respectively). The Wilderness Draft Site-Specific Analysis (SSA) for the WSA indicates that an additional 800 acres outside WSA boundaries are suitable for wilderness designation. This area is included in the preliminary wilderness suitability recommendation. Of this, 800 acres overlie the STSA. In summary, wilderness review affects a total of 4,040 acres of land in the STSA. Table 2-5 lists the various acres and percent of inventory units and WSAs within the Sunnyside and Vicinity STSA.

Land Uses and Land Use Plans

The principal land uses in the STSA are recreation, watershed, livestock grazing, and limited minerals exploration. Livestock use is discussed in the Livestock and Agriculture section and will not be repeated here.

Table 2-6 lists rights-of-way found within the STSA. BLM holds a lease for a communication site near Bruin Point located in Township 14 South, Range 14 East, Sec. 4, NE1/4NE1/4 on land owned by the Crosby Corporation and St. Mary Parish Land Company. Also located in this building is a navigational facility operated by the Federal Aviation Administration. The Bruin Point vicinity is used for communication purposes. The area provides a vital link in communications between central Utah and the rest of the State. Several communication sites, including ones held by American Telephone and Telegraph, Utah Power and Light Company, and other smaller firms, are located there. Only one of these facilities is on public land.

The Sunnyside STSA is within the Range Creek Planning Unit for which a URA/MFP were completed in May 11, 1974. At that time, a recommendation to make the tar sand area available for immediate lease and exploration was made. The management decision was to accept the recommendation, subject to stipulations protecting a potential ski area, the proposed Green River natural or wild and scenic area designation, and wild horses. Amended land use plans (URA/MFP) for the Price River Resource Area, including the Range Creek Planning Unit, are nearing completion and will categorize the tar sand area for leasing. The decision on leasing tar sand will be reached after several ongoing EISs are completed.

The Carbon County zoning ordinance has established critical environmental zones in the tar sand area to protect watershed values. The original ordinance designated the entire tar sand area as critical environmental; however, at the request of tar sand companies, some areas have been redesignated to allow major underground and surface mines as permitted conditional uses.

Socioeconomics

The affected areas would be mostly confined to Carbon County; however, some effects could be felt in Emery, Utah, Grand, and Duchesne. East Carbon and Sunnyside, 6 miles west of the STSA, would be the most heavily

affected communities, with some spillover spreading to Wellington and Price, 25 and 30 miles west of the STSA, respectively. For these reasons, the following discussion will be limited to these areas.

COUNTY DEMOGRAPHICS AND ECONOMY:

Growth and decline in Carbon County has been linked to the coal industry. The industry was expanding rapidly until the recent recession, which has caused layoffs in the mining sector. The mining industry is the largest employer and accounts for the largest share of income earned in the area. The construction and operation of nearby electrical generating plants also provide a large share of employment and income to the area. Employment and income from these power plants are reflected in the construction, public utilities, and mining sectors (see Table 2-7).

Between 1970 and 1980, Carbon County grew by 42 percent. The national recession and several other factors have temporarily halted or reversed the growth in local coal production. The Utah State Planning Coordinator's Office still projects coal production in central Utah to reach 21.6 million tons by 1990. Using these assumptions, a baseline population of 37,656 (a 68-percent increase) is projected for Carbon County by the year 2,000, (see Table 2-8).

East Carbon and Sunnyside: East Carbon and Sunnyside experienced moderate growth (+21 percent) in the 1970s, due mostly to natural growth (growth not related to large projects). In the 1950's these communities doubled their existing population. Two nearby coal mines account for most of the local employment. Recent layoffs have reduced employment in these mines by 25 percent. Most residents have lived in the area for some time, and there is a tendency for residents to seek nearby employment and commute (Lauriski, 1983; Vignetto, 1983).

East Carbon City and Sunnyside are two separate, although contiguous, municipal units and, for the purpose of basic service delivery systems, are integrated. These cities are isolated from the main population centers of Carbon County and have their own services (i.e., water, sewage and solid waste systems, police, schools, etc.). The communities will start construction in 1983 on a new 1.1-million gallon per day treatment plant and a 500,000-gallon storage reservoir for municipal water, which should be able to serve a population of 5,000. The treatment plant has been designed so that its capacity could easily be doubled in the future. There are no other major infrastructural constraints on growth.

Great Northern Corporation is in the planning stage for constructing a nearby semi-commercial tar sand pilot plant, which would employ 200 to 250 people by 1985.

Price and Wellington: Price and Wellington have experienced rapid growth in the 1970s (39-percent and 46-percent increases, respectively) and have experienced the usual infrastructure and social service problems associated with rapid growth. The Price and Wellington sewer system is now running over capacity and will shortly require major investments. Projected population growth will require additional municipal water supplies, which will likely come at the expense of agricultural water.

ECONOMIC-RELATED ACTIVITIES: Expenditures associated with hunting in the affected deer herd unit (27B) contribute 12 jobs and \$200,000 (0.1 percent) of locally earned income annually. For the most part, these and other recreation-related expenditures are well distrib-

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TABLE 2-5

Lands Under Wilderness Review for the
Sunnyside and Vicinity STSA

Wilderness Review Status	Number of Areas	Acres	Percent of STSA ^a	Percent of WSA ^b	Percent of Remanded Inventory Unit ^c
WSA Acres in STSA	3	620	0.39	0.24	0.20
Remanded Acres in STSA	2	2,620	1.66	N/A	0.85
Proposed Additional Suitable Acres in STSA	1	800	0.51	0.32	0.26
TOTALS	4	4,040	2.56	N/A	1.31

^aSTSA = 157,445 acres.

^bWSA = 250,750 acres.

^cRemanded unit, including WSA = A total of approximately 307,750 acres.

TABLE 2-6

Rights-of-Way Within the Sunnyside and Vicinity STSA

Serial Number	R/W Holder	Type and Width	Effective Date
U-40133	BLM	Road - 66 Feet	May 18, 1978
U-40134	BLM	Road - 66 Feet	May 18, 1978
U-40135	BLM	Road - 66 Feet	May 18, 1978
U-47455	Northwest	Pipeline	January 16, 1981
U-0171131	----	----	----
U-40096	Getty Oil	Road - 30 Feet	
U-34118	----	----	----
U-17884	Mountain Microwave	Communication Site ----	----

Source: USDI, BLM, 1974.

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TABLE 2-7

Income and Employment Data for
Carbon County in 1980

	Income (Percent)	Employment (Full & Part Time) (Percent)
Farm	0.5	2
Non-Farm	99.5	98
Private	87	77
Ag. Serv. and Forest	a--	a--
Mining	44	26
Construction	5	4
Manufacturing	2	3
Transport. & Pub. Utilities	12	8
Wholesale Trade	a--	a--
Retail Trade	8	14
Fire	2	3
Services	a--	a--
Government	13	20
Federal	2	3
State and Local	10	17
	(dollars)	(jobs)
TOTAL	\$154,843,000	9,029
Civilian Labor Force (3rd Qtr. 82)		9,376
Seasonally Adjusted Unemployment (3rd Qtr. 82)		9.2%

Source: USDC, 1982a; USDC, 1982b; UDES, 1982.

Note: The employment percentage figures do not include proprietors' employment and, therefore, underestimate the relative importance of agriculture. Income and employment figures are by place of work. Numbers may not be additive because of rounding.

^aNot shown to avoid disclosure of confidential data.

TABLE 2-8

Historic and Baseline-Projected Populations
in Carbon County

	1970	1980	1981	1985	1990	1995	2000
Carbon County	15,647	22,179	22,350	29,943	35,159	37,217	37,656
East Carbon CCD ^a		2,570		2,412	2,254	2,260	2,177
East Carbon City	1,614	1,942					
Sunnyside City	485	611					
Helper CCD ^a		4,620		5,878	6,573	6,793	6,815
Helper City	1,964	2,724					
Scofield City	71	105					
Price CCD ^a		14,989		21,653	26,332	28,164	28,664
Hiawatha Town	166	242					
Price City	6,218	9,086					
Wellington City	922	1,406					

Source: USDC, 1981a; Utah Office of the State Planning Coordinator, 1982.

^aCCD = Census County Division.

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uted among businesses in Carbon County and are of low local importance. However, these expenditures are significant to the lodges and commercial outfitters who operate in and near the STSA.

The STSA is an important source of forage for 16 livestock grazing operations. The seven allotments, located either wholly or partially in the STSA, have provided an annual average of 22,029 AUMs of livestock forage. Livestock production from this forage accounts for an estimated \$440,000 of gross revenue, \$175,000 of operator's returns to labor and investment, and \$365,000 of indirect and induced income annually.

PUBLIC ATTITUDES: Accelerated growth has resulted in social change and some loss of former lifestyles. Local governments and residents are now aware of the consequences of rapid growth and are wary of actions that may cause further growth. Because of the recent layoffs in East Carbon and Sunnyside, the attitudes toward growth in these communities would be more favorable (Lauriski, 1983; Vignetto, 1983; and Walker, 1983).

ENVIRONMENTAL CONSEQUENCES

Tar Sand Resources

Tar sand resource development could be by two methods. The first method, surface mining, would require a tar sand processing plant located near or at the mine site. The plant would extract the tar using heat, steam, solvents, or a combination of these processes. The second method (in situ) would involve a series of injection and production wells with the tar sand flooded by steam, hot water, solvents, or a combination of these processes. Present industry interest is limited to in-situ methods; therefore, this method would be limited in the Sunnyside and Vicinity STSA. Also, land reclamation measures with this method would be less than those required using surface mining. Underground mining is a remote possibility. Once development of tar sand was completed, any remaining tar sand would be foregone.

Although tar sand could be leased, development in areas affected by wilderness would be subject to the strictest nonimpairment standard, which could exclude tar sand development. Approximately 3 percent (4,040 acres) of the STSA is under IMP status (see Figure 2-11).

ALTERNATIVE 1, NO ACTION/MAXIMUM DEVELOPMENT: All percentages expressed herein are based on comparisons to the total of Federal-owned minerals within the STSA, unless otherwise stipulated. This alternative would allow approximately 95 percent (71,167 acres) of the STSA to be open for tar sand leasing and conversion. This would provide the maximum area available for tar sand development with the least restrictive stipulations of any alternative proposed.

However, environmental constraints would still be placed on tar sand development, even in category 1 areas. By regulation, a plan of operation must be provided by the operator prior to lease conversion and/or surface disturbance. Conditions of approval of that mine plan would come only after an EA or EIS were completed by BLM. It is anticipated that restrictive stipulations, beyond the standard stipulations (see Appendix 1), would be applied. It is entirely possible that areas such as streams, springs, steep slopes, and other sensitive areas would be closed to mining activities.

Considering these probabilities, this alternative would still offer the maximum acreage for tar sand leasing, conversion, and development. This alternative would make approximately 4 billion barrels of in-place oil available for extraction.

ALTERNATIVE 2, MULTIPLE USE: This alternative would place approximately 22 percent (16,161 acres) of the STSA in category 1, open to leasing. This area is thought to have the greatest potential for tar sand development. The remaining 78 percent of the STSA would be to open to conventional oil and gas leasing and development only.

Currently, full-scale tar sand development is not considered economical; this is not expected to change in the near future (i.e., 10 years). Development of tar sand would logically occur first in areas with the greatest potential (i.e., category 1 areas). After 10 years, assuming oil prices escalate, this alternative would limit tar sand development.

The effect on overall tar sand development would be expected to be similar to Alternative 1, because the highest quality tar sand and the most interest occurs in the category 1 area around Bruin Point. Some individual lease conversions to tar sand would be denied under this alternative. This alternative would make approximately 880 million barrels of in-place oil available for extraction.

ALTERNATIVE 3, MULTIPLE USE (PREFERRED ALTERNATIVE): This alternative would allow tar sand leasing and conversion on approximately 90 percent of the STSA under various environmental stipulations. Another 10 percent would be technically open to leasing and conversion in category 3 areas, but would be closed to surface occupancy. No acreages would be placed in category 1.

Because 90 percent of the STSA would be designated category 2, definite limitations would apply: no occupancy on slopes greater than 50 percent, no surface mining in sage grouse nesting/brooding habitat, seasonal restrictions on exploration because of wildlife concerns, special protection of the Sunnyside water supply reserve, and numerous other types of lease requirements. These special stipulations would be in addition to any standard stipulations (see Appendix 1) and any terms and conditions placed on the lease as a result of approval of a plan of operation.

The net result of these requirements would be a reduction of mining activities on an undetermined portion of category 2 areas. Although this alternative would place more restrictions on overall development, the major tar sand area would still be available.

ALTERNATIVE 4, RESOURCE PROTECTION: This alternative would place 65 percent of the STSA in category 2 and 28 percent in category 3. No areas would be placed in category 1.

Within category 2 areas, the entire STSA would be closed to surface mining; in-situ development or conventional oil and gas recovery would be the only type of hydrocarbon extraction allowable. This requirement would make most of the tar sand deposits unrecoverable, because much of the STSA has insufficient overburden for in-situ development.

Other Mineral Resources

Effects of mining on mineral values would vary. Oil and gas loss from tar sand development would probably be low

because of the processes that resulted in formation of the tar sand deposit. Any traces of liquid hydrocarbons would be incorporated in the tar sand ore and incorporated into the end product. Any traces of gas would be lost to the atmosphere. The tar sand and oil resources would be mined and consumed. Any oil shale deposits would be lost in the removal of overburden, but actual loss and its significance cannot be quantified. Mining of tar sand would not reduce the technological potential of coal mining; because of the depth of the coal seams, tar sand development would not affect this resource.

ALTERNATIVE 1, NO ACTION/MAXIMUM DEVELOPMENT: All of the above-mentioned impacts could occur.

ALTERNATIVE 2, MULTIPLE USE: The above-mentioned impacts could occur only within category 1 areas (21 percent of the STSA [16,161 acres]). All other areas would be closed to tar sand development.

ALTERNATIVE 3, MULTIPLE USE (PREFERRED ALTERNATIVE): The above-mentioned impacts could occur on approximately 90 percent (67,269 acres) of the STSA. The remaining 10 percent of the STSA would be closed to tar sand development because of conflicts with wildlife, watershed, vegetation, etc.

ALTERNATIVE 4, RESOURCE PROTECTION: Alternative 4 would eliminate surface mining, thus resulting in the least potential for impacts to other mineral resources.

Wilderness Values

Impacts to wilderness values would be limited because of two major factors: (1) less than 3 percent of the STSA is under IMP guidelines for wilderness; and (2) both new leases and all lease conversions would be subject to the nonimpairment criteria.

Approximately 4,040 acres are under IMP, and these are located on the extreme western portion of the STSA. Tar sand development in these areas is unlikely because it is not in the prime tar sand deposits. The nonimpairment criteria essentially require that any disturbance in an IMP area be temporary in nature, with the area reclaimed and the disturbance made substantially unnoticeable by 1991. This requirement would, for all practical purposes, preclude any tar sand development in an IMP area. Some limited exploration could occur because access and pad construction could meet the nonimpairment criteria, but an actual development could not. Consequently, the overall impact to wilderness values would be negligible or nonexistent.

Other Resource Values and Uses

AIR QUALITY: Surface mining could have a significant impact to air quality if overburden were removed with high explosives. A large plume of particulates normally rises several hundred feet into the air during such removal. The effect on air quality would depend upon: (1) type of overburden; (2) technique used in blasting; and (3) surface winds.

In-situ development would require heating of the tar sand. The method of heating would impact air quality.

Other change agents in air quality would be fugitive dust along roads, vehicle emissions, and processing plant emissions. Impacts are discussed in detail in the Regional Analy-

sis section (Volume I) and in the Combined Hydrocarbon Sunnyside EIS.

Alternatives 1, 2, 3, and 4: All of the above-mentioned impacts could occur; however, the extent could be different, depending on the degree of development.

GEOLOGY AND TOPOGRAPHY: Surface mining would irreparably alter existing topographic features. The extent of alteration could cover thousands of acres under full tar sand development. The possibility of removing 3 to 800 feet of overburden and an additional 800 feet of tar sand on tracts as large as 2 to 3,000 acres would cause major disruption of the topography. Characteristic features would be obliterated as mountains were removed and canyons filled by disposal. Reclaiming to original contours or blending reclaimed areas with adjacent undisturbed areas would be difficult or impossible to accomplish. In-situ development would not result in such major impacts to topography. A few feet of subsidence could occur.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts to topography could occur. Nearly the entire STSA (97 percent) would be potentially available to tar sand development with two exceptions: (1) the Sunnyside Water Supply Reserve, which would be closed to leasing; and (2) the Green River corridor, which would be open to leasing but restricted where visible from the Green River.

Alternative 2, Multiple Use: The highest quality tar sand area (21 percent of the STSA [16,161 acres]) would be placed in category 1 and would be open to tar sand leasing without special lease stipulations. All other areas within the STSA (79 percent) would be closed to any form of tar sand development. Only the category 1 area (see Figure 2-8) would be subject to the impacts to topography mentioned above.

Alternative 3, Multiple Use (Preferred Alternative): Approximately 90 percent of the STSA (67,269 acres) would be open to tar sand leasing under category 2; however, certain areas would contain stipulations not allowing surface mining and would be subject to the impacts discussed above. Special stipulations assigned under category 2 would limit the amount of disturbance at any given time to 25 percent of the lease area. This would not, however, have much ameliorating influence on total impacts to topography. It would limit such impacts only to a point in time; long-term topography changes would occur. The remaining 10 percent of the STSA would be closed to surface occupancy in category 3 (see Figure 2-9).

Alternative 4, Resource Protection: Surface mining would not be allowed in any part of the STSA open to leasing; consequently, impacts to topography would not occur. However, in-situ mining could occur potentially resulting in subsidence on 65 percent of these areas.

SOILS: On the whole, strippable soils of sufficient depth to allow short-term (less than 5 years) reclamation are limited in the STSA. Natural soil structures and zonations would be completely destroyed by surface mining. Overburden would require extensive modification before it would support plant and animal life (10 years).

Construction related to in-situ development (i.e., roads and pads) would alter topsoils. Standard procedures of topsoil saving and revegetation would be necessary, or permanent loss of soil productivity would result. Mining

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activities, road construction, and drilling pad construction all could disturb several thousand acres, depending on the ultimate extent of tar sand development. All such disturbance would subject the disturbed soils to erosion by removal of the vegetation and forest duff layer.

The exposed soils in the moderate to high precipitation zones of the STSA would pose a serious erosion hazard, especially on steep slopes (20 percent or greater). Areas with slopes greater than 50 percent could not be completely reclaimed, and erosion hazards would be severe.

Standard erosion control measures developed for roads and drilling pads with each plan of operation would reduce but not eliminate soil erosion. Steep slopes would be subject to moderate to severe erosion hazard.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur throughout the STSA, with the exception of the Sunnyside Water Supply Reserve and the Green River corridor. Impacts could occur on 95 percent of the STSA (71,167 acres).

Alternative 2, Multiple Use: This alternative would allow the impacts mentioned above to occur mostly in category 1 areas (21 percent of the STSA) (see Figure 2-8). This is the most valued tar sand area. The remaining 78 percent of the STSA (58,749 acres) would be closed to tar sand development.

Alternative 3, Multiple Use (Preferred Alternative): All of the previously mentioned impacts could occur on up to 90 percent of the area; however, the extent would be limited, because of special stipulations in category 2 areas. Special stipulations would reduce soil erosion by limiting development on slopes greater than 50 percent by prohibiting surface mining in sage grouse areas and by restricting surface disturbance through seasonal restrictions and stipulations.

Alternative 4, Resource Protection: Approximately 35 percent (25,812 acres) of the STSA would be closed to tar sand leasing or surface occupancy in categories 3 and 4. The remaining 65 percent in category 2 would have special stipulations limiting surface disturbance on slopes greater than 50 percent and closing the entire STSA to surface mining. Soil erosion and reduced soil productivity would be considered minor.

VEGETATION: Surface mining would pose the greatest threat to vegetation through large area disturbance and, in many cases, loss of the topsoil. Since most of the higher value tar sand deposits are located at higher elevations, the loss of vegetation would involve spruce, fir, and aspen forests. Reestablishment of a conifer forest would take decades in areas that were surface mined. Natural revegetation of Douglas fir would not occur below 8,500 feet. Forest losses would occur from pad, road, and facility area construction as well as from surface mining. Forest resources are not considered commercial at this time.

In-situ development methods would reduce considerably the total acreage of vegetation disturbed. An in-situ development field would probably disturb at least 40 percent of the area as compared to 100-percent disturbance resulting from surface mining. Roads, pipelines, and pads would be the disturbing agents for in-situ development. Revegetation of an in-situ development field would be easier and quicker than with surface mining because more topsoil is normally saved and the area disturbed is smaller. Revegetation would be successful wherever adequate topsoil was saved and disturbance occurred above 7,000 feet. Revege-

tation would be almost complete within 5 years of initial reseeding or planting. However, this would apply only to herbaceous understory and most shrubs. Reestablishment of conifer forests would require decades. Southern exposures and areas with limited topsoil would not be revegetated with large woody species.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur throughout the STSA if tar sand development occurred. The only areas not impacted would be the Sunnyside Water Supply Reserve and the Green River corridor.

Alternative 2, Multiple Use: The impacts mentioned above could occur, but only in category 1 areas (21 percent of the STSA) (see Figure 2-8). The remaining 78 percent of the STSA would be open to oil and gas leasing only. Impacts would be similar, but the areal extent would be less.

Alternative 3, Multiple Use (Preferred Alternative): The impacts discussed above could occur on 90 percent of the CHL leases in category 2 areas (see Figure 2-9). Various stipulations applied to CHL leases in category 2 areas would influence impacts to vegetation: (1) slopes greater than 50 percent would be closed to surface occupancy unless written permission were obtained from BLM; (2) sage grouse nesting habitat would be closed to surface mining; (3) a maximum of 25 percent of a lease could be disturbed from mining at any given time; and (4) seasonal restrictions for wildlife and viewing areas would all reduce the total area disturbed from mining activities.

The remaining 10 percent of the STSA would be closed to tar sand development in category 3. No disturbance to vegetation would occur in these areas.

Alternative 4, Resource Protection: The entire STSA would be closed to surface mining. All impacts to vegetation resulting from surface mining would be eliminated. In-situ development could occur on approximately 65 percent of the STSA in category 2 areas (see Figure 2-10).

Impacts to vegetation from in-situ development would be affected and modified by the special stipulations in category 2, as stated under Alternative 3. The least impacts to vegetation would be expected with this alternative. Approximately 35 percent of the STSA would be closed to surface occupancy or leasing with categories 3 and 4.

WATER RESOURCES: Surface mining would alter the landscape and change drainages and drainage areas. As soils and vegetation were removed, the volume and timing of runoff would change. With decreased infiltration, stream flows would be higher after storms, but recessions would be steeper and base flows lower. If infiltration were increased, stream flows after storms would be lower, recessions longer, and base flows higher. Disturbed soils, overburden, and tailings would all have the potential to contaminate local and downstream water supplies.

Surface mining would remove the geologic units that form the local aquifers. The flow of springs and seeps would be reduced or eliminated as these recharge areas were mined away. Since most of the springs are public water reserves, the public water source would be affected, even with requirements to mitigate loss of flow and decreased water quality.

In-situ development poses special problems, since fluids could be injected to dissolve the bitumen or other methods used to decrease viscosity. Some of the tar sand deposits

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outcrop along drainages. Since there are no structural or stratigraphic barriers to contain fluids, it is probable that chemical or hydrocarbonaceous seeps could form along tar sand outcrops downgradient from the injection points. Also, the mixing of any injected fluids with the groundwater could decrease the quality of existing springs.

Alternative 1, No Action/Maximum Development: This alternative would allow disturbance of the surface and sub-surface on 95 percent of the area (71,167 acres) within the STSA. All of the impacts mentioned above could occur.

Alternative 2, Multiple Use: Impacts would be the same as those occurring in Alternative 1 on 21 percent of the area (166,161 acres) in category 1 areas (see Figure 2-8). While oil and gas development could occur on the balance of the area (79 percent), little development is expected.

Alternative 3, Multiple Use (Preferred Alternative): Development could occur on 90 percent of the STSA (67,269 acres); however, major drainages would be closed to surface occupancy and all slopes in excess of 50 percent would have limited disturbance. This would reduce sedimentation to surface water. Category 2 areas all have a stipulation requiring detailed hydrological analysis before any mining could occur. This might or might not provide adequate knowledge to protect aquifers and base flow. Additionally, all category 2 areas open to tar sand development would carry a special stipulation requiring complete mitigation of springs, seeps, and stream base flow by providing other water sources. This would mitigate most flow losses, but the potential for contamination would remain. The potential for loss of flows or contamination would remain in the Sunny-side Water Supply Reserve if major mining were allowed.

Alternative 4, Resource Protection: This alternative would close the entire STSA to surface mining; therefore, a major reduction in the above-mentioned impacts would result. However, in-situ mining would pose contamination potential in all category 2 areas (65 percent of the STA) (see Figure 2-10) and possibly in the downstream or downgradient areas, regardless of category designation. Watershed impacts would be limited to physical disturbance from roads, drilling pads, and pipelines.

WILDLIFE: Prime and unique wildlife habitat types within the STSA are riparian areas and aspen groves. These areas, if disturbed, would have the greatest impact to more wildlife species than any other areas of equal size in the STSA. Virtually all the wildlife species in the region use these areas during some part of their existence.

Impacts to wildlife would occur in several different ways: (1) reduced quality of habitat where revegetation is poor or slow; (2) possible modification to migration routes; (3) loss of water or access to water; and (4) loss or disturbance of fawning or calving areas. The impacts would result from direct loss of habitat from mining, road construction, etc., and secondary impacts from increased human access and disturbance.

Mule deer habitat in herd unit 27B would be impacted because 35 percent of the summer ranges is in the STSA. Herd size is currently estimated at 40 percent of prior stable levels. An additional decrease in population could occur, depending on effects on fawning areas, migration corridors, water availability, and other elements essential for deer summer and winter habitat. Many impacts to the deer herd would be permanent. Loss of deer winter range would be

less important, because of the total amount of winter range available outside the STSA.

A reduction in summer range for the Range Creek herd unit could be equally or more important to the newly reestablished elk herd for the same reasons, with the potential for elk to relocate. Impacts to elk winter range would be less critical, because of the total amount of available winter range used by this species. The limited moose habitat could also be affected.

Three known strutting grounds and portions of associated nesting and brooding area could be lost to surface disturbance. This would represent approximately 50 percent of the sage grouse population on the Tavaputs Plateau. Blue and ruffed grouse and chukar partridge habitat within the STSA could also be similarly lost and populations displaced.

Perennial streams in the STSA which support fisheries could be altered and possibly lost by surface mining, dewatering, or contamination. This would include good trout fisheries in Rock Creek, Range Creek, and Flat Canyon.

TREATENED, ENDANGERED, AND SENSITIVE SPECIES: Golden eagles (a sensitive species) and other raptor habitat within the STSA would be lost and populations reduced, depending upon the extent of tar sand development. However, little impact is expected to wintering bald eagles and peregrine falcons (endangered species) because the STSA does not provide any concentrated use areas for these species. Potential peregrine falcon nesting habitat and possible existing nesting activity could be affected. The potential habitat for the sensitive Colorado cutthroat trout in Flat Canyon could also be reduced or lost.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts would occur.

Alternative 2, Multiple Use: Tar sand development could only occur in category 1 areas (see Figure 2-8) which covers approximately 21.6 percent of the STSA. This would mitigate all of the above-mentioned impacts except the following: (1) elk and deer summer range would be subject to disturbance, potentially reducing herd size; (2) raptors in category 1 areas would be affected as mentioned; (3) aspen groves would be subject to disturbance, resulting in loss of unique wildlife habitat; and (4) riparian areas would be affected as mentioned above.

Alternative 3, Multiple Use (Preferred Alternative): Tar sand development would be allowed on 90 percent of the STSA (category 2 areas only, see Figure 2-9). Deer and elk summer and winter ranges could be lost as mentioned above; however, some protection would occur through category 2 stipulations requiring off-site enhancement of aspen groves and the 25-percent restriction on lease disturbance. The effect of these stipulations cannot be quantified, but would reduce disturbance to deer and elk.

Sage grouse habitat loss would be avoided by restricting surface occupancy on known strutting grounds and prohibiting surface disturbance in the nesting/brooding habitat. The known golden eagle nest site would be avoided with the no surface occupancy or other activity stipulation requiring protection of nest sites.

All of the major perennial and intermittent streams and their riparian areas would be in category 3, no surface occupancy (see Figure 2-9); however, contamination and

sedimentation could still occur. The potential from dewatering would remain, but would be partially mitigated with the category 2 stipulation, which would require replacement of any waters lost.

Alternative 4, Resource Protection: Approximately 65 percent of the STSA would be in category 2 and would be open to tar sand leasing (Figure 2-10). The above-mentioned impacts would be reduced by replacement of the aspen groves, perennial and intermittent streams (riparian areas), sage grouse nesting/strutting areas, the known eagle nest, and steep-sloped watersheds in a combination of no lease and no surface occupancy. Restricting surface occupancy in known calving/fawning areas and migration corridors would reduce most off-site impacts to deer and elk. The remaining category 2 areas would be closed to surface mining; this would avoid many of the potential impacts to deer and elk.

LIVESTOCK AND AGRICULTURE: Removal of vegetation would reduce the amount of forage available for livestock grazing in all allotments affected by development. The summer ranges in Green River, Dry Canyon, Stone Cabin, and Sheep Canyon allotments could be severely reduced, depending upon the amount of surface disturbance. Grazing in Max Canyon could be effectively eliminated with tar sand development.

The livestock operators could lose use of one corral and approximately 5 miles of fence located within the STSA. Four developed springs could also be lost. Changes in management and distribution of livestock would result. The effect of either type of tar sand development would reduce the amount of livestock forage available for an extended period of time until successfully revegetated. The wild horse population could be displaced in the eastern portion of the STSA.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts would occur.

Alternative 2, Multiple Use: Impacts mentioned above would occur in category 1 area (21 percent of the STSA) only (see Figure 2-8). Therefore, impacts to livestock management, distribution, and grazing would be limited primarily to the Stone Cabin, Dry Canyon, and Sheep Canyon allotments. Wild horses would be protected from development.

Alternative 3, Multiple Use (Preferred Alternative): Approximately 90 percent of the STSA would be subject to surface mining and/or in-situ tar sand development; this would include category 2 areas only (see Figure 2-9). Therefore, most of the allotments could be impacted as previously discussed. The 25-percent limit on surface disturbance in category 2 areas would avoid some of the impacts but would not eliminate them. Wild horses would be displaced.

Alternative 4, Resource Protection: None of the STSA would be open to surface mining in category 2 areas (see Figure 2-10). In-situ development would result in less loss of forage than surface mining. The construction of roads, pipelines, and pads would result in changes in management and livestock distribution on 65 percent of the STSA. Most of the wild horse habitat would not be disturbed.

VISUAL RESOURCES: Tar sand development on the western face or ridge tops of Roan Cliffs would be visible to approximately 766,500 travelers per year along Highways 6, 10, and 191 (UDOT, 1979). Surface mining could disturb

as much as the upper 1,000 feet of cliffs and ridge tops.

Visual impacts would occur through disturbance of vegetation and soil. The surface mining equipment would, by its nature, create more visual intrusion. Roads, drilling pads, pipelines, and storage tanks from in-situ development could be screened and painted to reduce visual impacts. However, this would not be possible with surface mining.

Road construction and/or development on steep slopes (greater than 20 percent) would produce major alterations in the visible area. A 55-foot travel surface road on 50-percent sideslopes would produce a cut face approximately 110 feet high and a side-cast road fill over 200 feet long. Much of the STSA has slopes in excess of 100 percent. Road cuts and fills on such slopes would encompass the entire hillside, regardless of slope.

Approximately 84 percent of the STSA is in VRM Classes II and III. These areas are primarily located along Roan Cliffs and in the higher elevations of the STSA. Tar sand development in these areas would represent the greatest impacts to high quality visual resources. Such development would exceed present VRM class objectives.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur throughout the STSA with the exception of the Sunnyside Water Supply Reserve. This area would be placed in category 4 and would not be open to leasing.

Alternative 2, Multiple Use: All of the impacts mentioned above could occur in category 1 areas (21 percent of the area) only (see Figure 2-8). Much of this area would not be visible from the regional highways. However, the cliff skyline is visible from highways 6, 10, and 191; therefore, all of the impacts to visual resources could occur as described earlier, but would be restricted to category 1 areas.

Alternative 3, Multiple Use (Preferred Alternative): Approximately 90 percent of the STSA would be open to tar sand leasing and, subsequently, subject to the impacts mentioned above. These areas are illustrated on Figure 2-9. All category 2 areas would have a stipulation prohibiting surface disturbance on slopes in excess of 50 percent without written permission of the BLM and a stipulation that only 25 percent of a lease could be developed at any one time. These stipulations would not prohibit high visual impacts from occurring on steep slopes, but would limit the amount and location. Category 3 areas would not be subject to the impacts mentioned above.

Alternative 4, Restricted Development: This alternative would close approximately 35 percent (25,821 acres) of the STSA to tar sand and oil and gas development within categories 3 and 4. The remaining 65 percent would be in category 2 with special stipulations. Those stipulations would prevent deterioration of visual resource values. As a result of these categories and stipulations, most impacts to visual resources would not occur, except for those associated with road and pad construction, pipelines, and storage facilities. Depending on where these actions took place, the visual impact could be as significant as that occurring with surface mining. All of the impacts previously mentioned from road development could occur.

CULTURAL RESOURCES: Surface mining would destroy archaeological and historical sites. Normal mitigation for these resources is avoidance or salvage. Large-scale surface mining precludes the former; therefore, salvage is

the only option. However, salvage would occur only on significant sites. In-situ development would rely primarily on avoidance for protection. However, secondary impacts of vandalism could not be avoided.

The archaeological and historical impacts would be greatest in the Nine Mile Canyon Archaeological District. Any development in this area would impact a large number of sites, and all affected sites would be subject to review by the Utah State Preservation Officer and the National Advisory Council on Historic Preservation.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur on 90 percent of the STSA. Archaeological and historical sites subject to development within Nine Mile Canyon could be destroyed. Data recovery from the excavation of these significant sites and any other identified sites would only partially mitigate the effects of development. All sites destroyed would be lost to future scientific studies. This loss could not be mitigated.

Alternative 2, Multiple Use: The above-mentioned impacts would occur in category 1 areas (21 percent of the STSA) (see Figure 2-8). The Nine Mile Canyon Archaeological District would not be affected.

Alternative 3, Multiple Use (Preferred Alternative): All of the above-mentioned impacts could occur wherever surface mining was used for tar sand development (see Figure 2-9). Approximately 90 percent of the area would be open to tar sand leasing. The steep slopes would place some restriction on tar sand development in Nine Mile Canyon, but surface mining could impact archaeological and historical values present.

Alternative 4, Restricted Development: None of the STSA would be subject to potential surface mining impacts (see Figure 2-10). The Nine Mile Canyon Archaeological District would be placed in a combination of categories 3 and 4 and would not be subject to disturbance. Category 2 areas would be closed to surface mining but open, with special stipulations, to in-situ tar sand and conventional oil and gas development. This would greatly reduce the potential for archaeological resource loss. Avoidance would be effective in most cases.

RECREATION: Recreational opportunities in the Bruin Point view area would be reduced by extensive surface disturbance. Some distant views of the natural landscape from Bruin Point could remain, depending on reductions in elevation by surface mining and visual obstacles. The desirability of the area for picnicking or camping would be diminished where surface mining or other extensive surface disturbance occurred.

The scenic, archaeological, and historical setting in Nine Mile Canyon would be diminished by extensive surface disturbance. Cultural remains, now viewed in their natural setting, would be removed, damaged or destroyed where such disturbances occurred. Thus, the desirability of the canyon area for present recreational uses would be reduced or eliminated where extensive surface disturbance or mining occurred. The asphalt tramway in the upper stretch of Water Canyon could also be removed if surface mining were undertaken, further reducing the opportunities for viewing of the historic site.

Effects on hunting activities would depend largely upon effects on access and wildlife. If surface disturbance or development substantially altered or eliminated access or

diminished the deer herd (or other hunted wildlife) through reduced habitat, hunting opportunities would also be diminished in the affected areas. Recreational use associated with hunting would also be expected to decrease. Potential contamination and sedimentation, especially in the Rock and Bear Creek drainages, would reduce the opportunity for fishing and, consequently, lower the quality of the experience.

The recreational and scenic values, for which the tributary canyons to the Green River corridor were identified, would be severely diminished by surface-disturbing activities. Slopes are steep, and reclamation potential is poor. Changes in water supply, spring location, or water quality could cause visual changes through decreased riparian vegetation and changes in the availability of water. The presence of large-scale tar sand development would encourage visitation by college classes, government agencies, industrial groups, and other interested parties for scientific viewing.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur on 95 percent of the STSA (71,167 acres). The impacts to the Green River corridor probably would not occur in category 2 areas (see Figure 2-7); special stipulations would prevent development if visible from the Green River.

Alternative 2, Multiple Use: This alternative would restrict tar sand development to category 1 areas only (21 percent of the STSA) (see Figure 2-8). Therefore, many of the above-mentioned impacts would be fully or partially avoided. The potential for impacts in the Bruin Point area and impacts to hunting activities throughout the STSA would remain; however, disturbance would be restricted to category 1 areas.

Alternative 3, Multiple Use (Preferred Alternative): All of the impacts previously mentioned could occur on portions of the STSA. All category 2 areas (90 percent of the STSA) shown on Figure 2-9 would be subject to full-scale tar sand development. Special stipulations limiting the surface disturbance to 25 percent of a lease area at any one time, restricting occupancy on slopes greater than 50 percent, and seasonal restrictions of development would reduce the extent of activities crucial to wildlife in category 2 areas.

Alternative 4, Restricted Development: This alternative would place 66 percent of the STSA in category 2 with restrictive stipulations which excluded surface mining. The remaining 34 percent would be placed in categories 3 and 4, no surface occupancy or closed to leasing; therefore, the impacts to recreation mentioned above would be reduced or avoided. The impacts mentioned above would be eliminated, with the following exceptions: (1) recreational use of the Bruin Point area could be reduced because roads, drill pads, and pipelines resulting from in-situ development; (2) hunting and fishing impacts would remain as mentioned; and (3) scenic values in the Green River corridor could be diminished by the presence of in-situ facilities and access roads.

WILDERNESS: See Introduction to this chapter.

LAND USES AND LAND USE PLANS: Existing rights-of-way and public roads are valid existing rights and would be protected or relocated as needed. Other roads could be impacted from tar sand development. In-situ development could avoid physical disturbance to such roads. Tar sand development on any scale would require many additional rights-of-way and major improvements to

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existing access. Reconstruction of existing roads and construction of new roads would be required. Mitigation to specific rights-of-way would be accomplished at the plan of operation stage in virtually all cases. Obliterated roads and rights-of-way would require restoration or realignment as specified by BLM and/or the right-of-way holder.

Alternative 1, No Action/Maximum Development: This alternative would have the highest potential for conflict between existing rights-of-way and tar sand development. All of the impacts described above could occur.

Alternative 2, Multiple Use: The above-mentioned impacts would occur primarily in category 1 areas (see Figure 2-8). However, any tar sand development would require additional access roads and/or reconstruction of existing roads. This could affect portions of the entire STSA.

Alternative 3, Multiple Use (Preferred Alternative): Generally, the impacts to rights-of-way and public roads would be the same as Alternative 2 because of the greater restrictions on tar sand development for protection of other resources (i.e., deer and elk summer range, regional aquifers, etc.). However, obliteration of roads and pipelines from surface mining would not occur.

SOCIOECONOMICS AND PUBLIC ATTITUDE:

Most of the socioeconomic impacts associated with the STSA's development would occur in Carbon County and, in particular, in East Carbon and Sunnyside communities because of their proximity, available labor force, and the ability of their infrastructures to accommodate moderate population increases.

Because of the size of the tar sand resource and the potential number of projects, most of the construction work force would come from outside the area. The operational work force would have a greater proportion of local hired workers, and those not hired locally could eventually become permanent residents. In the long run, employment in Carbon County would increase.

East Carbon's and Sunnyside's infrastructures could accommodate moderate population increases. However, the magnitude of growth would require a substantial increase in the communities' housing stock and public services. The supply of dwelling units usually lags behind demand. A short-term inflation in housing cost could, therefore, be expected. Many other costs of living, including payments to local units of government, would rise faster during these periods of rapid growth. These impacts would affect both new and current residents.

Local units of government would both receive additional revenues and bear additional costs from development in the STSA. Some of the fiscal problems which could arise from development include: (1) the time lag between the costs on affected units of government and the normal beginning of additional tax revenue receipts; and (2) the relative difference between the development-related revenues collected by each unit of local government and the costs each must bear.

Tar sand would be assessed by the State as a nonmetal property. County officials in Carbon and Emery counties have claimed that the State's existing assessment procedure places a lower assessment on nonmetal property, relative to the property's true market value, than the assessment procedures used for other commercial developments. Property tax revenues from tar sand develop-

ment would, therefore, be lower than that expected from other commercial developments of a similar scale.

Developers could be required to submit a socioeconomic and fiscal impact assessment, based on the expected size of each tar sand development along with a mitigation plan to both the State's Department of Community and Economic Development and affected local governments (Carbon County, 1982; Bunnell, 1981). Utah Senate Bill 170 allows developers to mitigate fiscal impacts through sales and property tax prepayments which could be credited to future taxes. Carbon County's development code requires county approval of the assessment and mitigation plan before it issues the necessary rezoning and conditional use permits. The county would, therefore, have some control over the developer's mitigation of local socioeconomic and fiscal impacts.

The loss of forage from surface activities would result in a reduced ranch income of \$175,000 from return on labor and investment. This would affect 16 livestock operators now using the area. There would be fair market compensation for any surface disturbance on lands with private surface ownership.

Tar sand development of the STSA would have a significant impact on deer hunting in herd unit 27B. A decreased deer herd population would lower hunter success rates and would reduce the number of hunters and lower local expenditures. The decreased local recreation-related expenditures would be most significant to those lodges and commercial outfitters who operate in the area.

Development of the STSA would significantly affect Carbon County's existing economic conditions by increasing job opportunities and stimulating growth. Demographics would change because of a population increase caused by short-term construction. However, the area's cultural diversity and experience with past "boom-bust" type growth would help moderate any social problems arising from projected growth levels. Awareness of the problems associated with rapid growth has caused local government to be cautious when considering growth. Because of the high unemployment rates in East Carbon and Sunnyside communities, there could be a greater receptiveness toward growth.

The rural nature of the affected communities is a lifestyle value for those who live nearby. Some rural lifestyle values would be lost. Tar sand development in the Sunnyside area would provide a new domestic energy source, which could reduce the nation's dependence on foreign energy.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur.

Alternative 2, Multiple Use: Under this alternative, 78 percent of the STSA would be closed to tar sand development. However, areas with the highest development potential (22 percent of the STSA) would have few restrictions. Production and the related socioeconomic effects would, therefore, be similar to Alternative 1. If economic conditions warranted production from areas of less quality, production and socioeconomic effects with tar sand closures would be less than Alternative 1.

Alternative 3, Multiple Use (Preferred Alternative): Approximately 90 percent of the STSA would be open to leasing in category 2. Various protective stipulations would have some restrictions on location and type of development,

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but overall socioeconomic effects would occur.

Alternative 4, Resource Protection: Since 32 percent of the STSA would be in the highly restrictive leasing cate-

gories (3 and 4), surface disturbance, production, and related socioeconomic effects would be less than those described above.

White Canyon STSA

MAJOR ISSUES

The White Canyon STSA is located in the lower part of White Canyon in west-central San Juan County, Utah, between Glen Canyon NRA at Lake Powell and Natural Bridges National Monument. The STSA is crossed by U-95, Utah's Bicentennial Highway. The area is arid, with pinyon-juniper forest on mesa tops and desert shrub communities elsewhere. The STSA is noted for its high quality scenery and bighorn sheep habitat.

The major issues related to tar sand development are as follows:

- **Visual Resources:** The STSA is crossed by U-95 which has been designated as Utah's Bicentennial Highway. Federal agencies developed recommendations restricting development and visual intrusions along Highway U-95. Tar sand development could conflict with these recommendations.
- **Desert Bighorn Sheep:** The STSA includes habitat for bighorn sheep, and impacts from tar sand development could eliminate these animals from the STSA.

ALTERNATIVES

Alternative 1, No Action/Maximum Development

BLM would take no new action and would maintain existing oil and gas categories. All new leases and CHLs would conform to existing stipulations and restrictions.

Existing categories are illustrated on Figure 2-11. A small area in the southern tip of the STSA is in category 3 (no surface occupancy) for protection of yearlong desert bighorn sheep habitat. Another small portion in the extreme northern portion is in category 4 (no lease) to protect the Dark Canyon Primitive Area. The following lists the approximate acres and percent of the STSA in the various categories:

Category	Acres	Percent
1	7,805	97
2	0	0
3	120	1
4	160	2

Alternative 2, Multiple Use (Preferred Alternative)

This alternative combines four categories to protect special resource values and provide for hydrocarbon (tar sand, oil, and gas) development. As in Alternative 1, all new leasing and conversions would conform to the categories shown on Figure 2-11. The following lists the approximate acres and percent of the STSA in the various categories:

Category	Acres	Percent
1	3,078	38
2	4,727	58
3	120	2
4	160	2

The following section describes sensitive areas within the STSA. Figure 2-12 shows the locations of these areas.

No. 80, Dark Canyon Primitive Area (Category 4, 160 Acres). A small portion of the rugged Dark Canyon Primitive Area overlaps the STSA. The extreme topography of the area would make reclamation difficult. Therefore, the continuation of the category 4 (no leasing) designation was recommended.

No. 91, San Juan Desert Bighorn Sheep (Category 3, 120 Acres). The San Juan Desert area is crucial yearlong habitat for bighorn sheep. Bighorn sheep are relatively intolerant of human intrusion; consequently, tar sand development would have an adverse effect on their population. The category 3 designation would be retained for this area from Alternative 1.

No. 102, U-95 Scenic Corridor (Category 2, 2,340 Acres). The U-95 Highway was dedicated as "Utah's Bicentennial Highway" in the early 1970s; an interagency corridor study recommended protection of the scenic and recreational values along this visual corridor. Because of that study and the extreme topography of the area, category 2 was recommended with a stipulation to protect the U-95 corridor. The area is also seasonal habitat for desert bighorn sheep. To partially restrict disturbance during lambing periods, a category 2 stipulation was recommended.

Stipulations:

- No access or work trail or road, earth cut or fill, structure or other improvement, or mine will be permitted if it can be viewed from U-95. This requirement may be modified when specifically approved in writing by the authorized officer of BLM.
- To protect desert bighorn lambing areas, exploration, drilling, and other development other than active mining will be allowed only from June 16 through April 30. This limitation does not apply to maintenance and operation of producing mines or wells. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

No. 103, San Juan Desert Bighorn Sheep Area (Category 2, 2,387 Acres). The same seasonal restriction (March 1 through June 30) was applied to the San Juan desert bighorn sheep area as shown on Figure 2-12. The area is seasonally utilized by bighorn sheep during rutting and lambing periods. Because of the sheep's low tolerance for disturbance at this time, a seasonal restriction on development activities was also recommended.

Stipulation:

- No access or work trail or road, earth cut or fill, structure or other improvement, or mine will be permitted if it can be viewed from U-95. This requirement may be modified when specifically approved in writing by the authorized officer of BLM.
- To protect desert bighorn lambing areas, exploration, drilling, and other development other than active mining will be allowed only from June 20 through March 1. This limitation does not apply to maintenance and operation of producing mines or wells. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

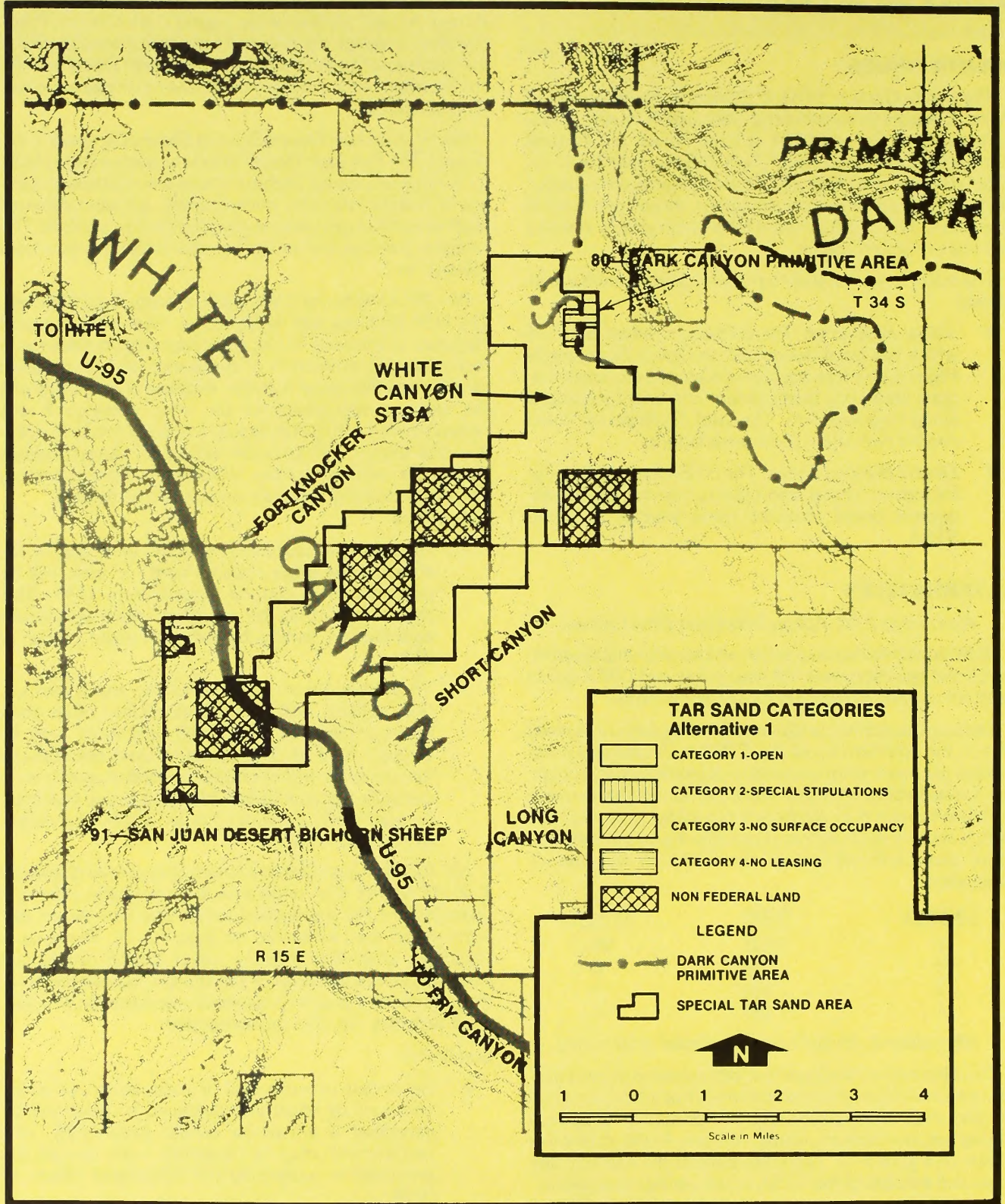


FIGURE 2-11
ALTERNATIVE 1, WHITE CANYON STSA

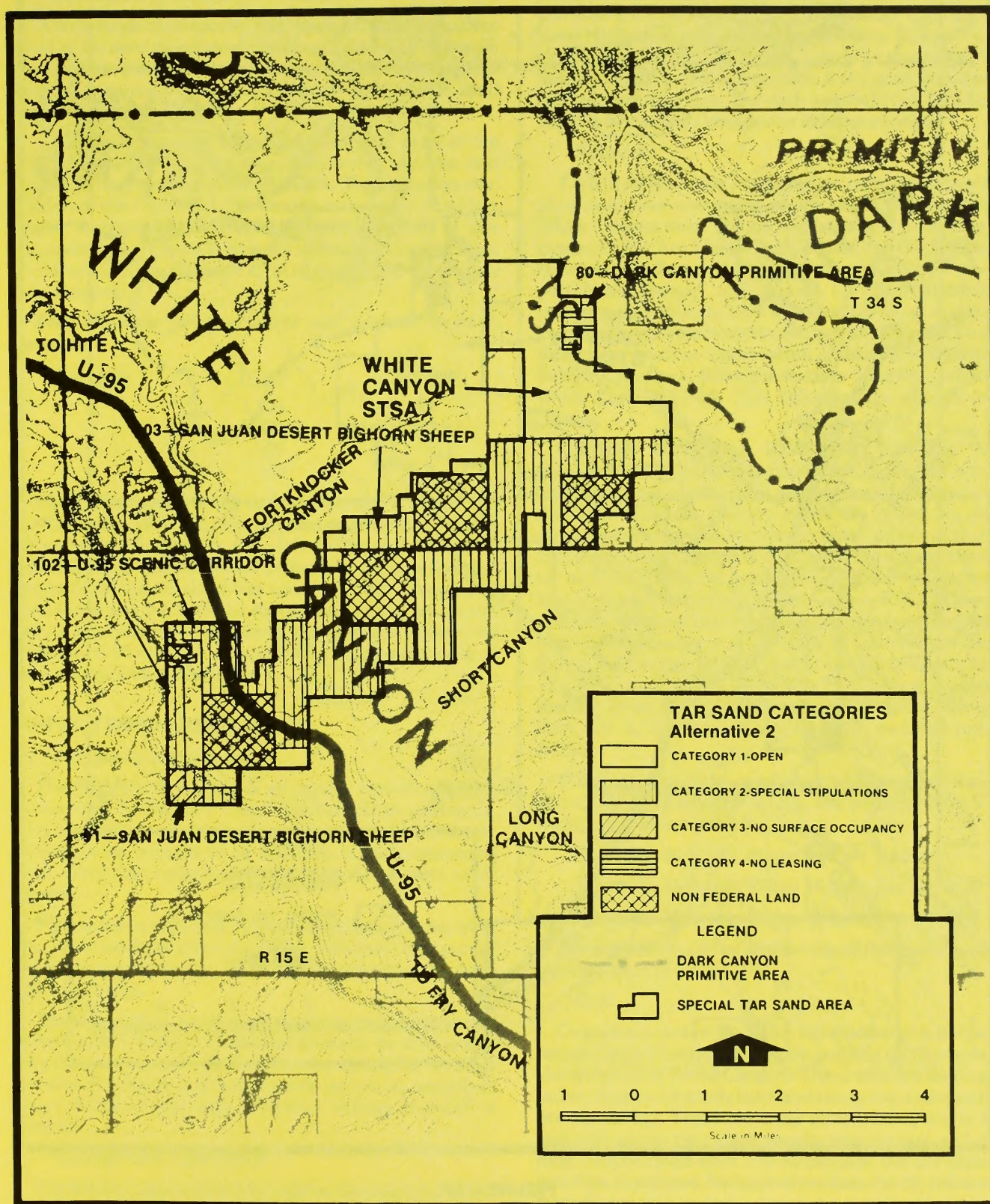


FIGURE 2-12
ALTERNATIVE 2, WHITE CANYON STSA

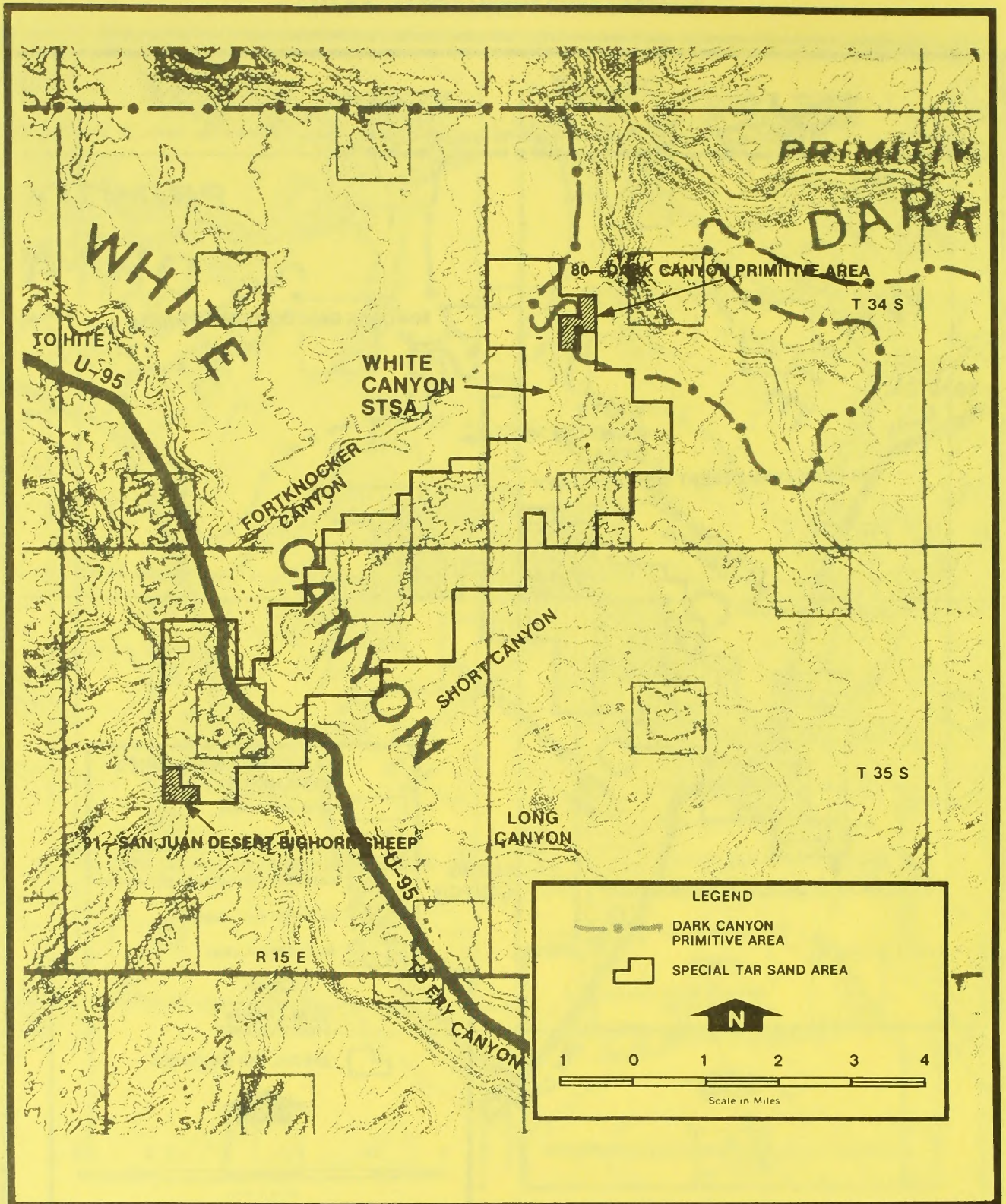


FIGURE 2-13
SENSITIVE AREAS, WHITE CANYON STSA

WHITE CANYON STSA

Alternative 3, Resource Protection

A wide range of categories and stipulations allowing some level of tar sand development were considered in development of this alternative. It provides for realistic protection of special resource values, but does not exclude tar sand development.

Category 2 area was expanded to include most of the STSA, including the Highway U-95 scenic corridor and suspected bighorn sheep habitat areas. The extension stipulation of the Highway U-95 viewing area would provide a slight increase in protection; however, most of the expanded area (Figure 2-14) is not visible from the highway. The Dark Canyon Primitive Area would remain in category 4 (no leasing).

The following lists the acres and percent in each category:

<u>Category</u>	<u>Acres</u>	<u>Percent</u>
1	1,924	24
2	5,881	73
3	120	1
4	160	2

No. 102, Highway U-95 Scenic Corridor (Category 2, 5,881 Acres). The U-95 Highway was dedicated as "Utah's Bicentennial Highway" in the early 1970s; an interagency corridor study recommended protection of the scenic and recreational values along this visual corridor. Because of that study and the extreme topography of the area, category 2 was recommended with a stipulation to protect the Highway U-95 corridor. Stipulations would be the same as those listed under Alternative 2.

AFFECTED ENVIRONMENT

Air Quality and Climate

The STSA is in a Class II air quality classification, as determined by the 1977 Clean Air Act and amendments. This class allows moderate increases in air pollution levels. There are no sources of air pollution in the surrounding area, other than natural particulates produced from windstorms.

The climate is semi-arid. Annual precipitation varies from 8 to 13 inches throughout the STSA, with mesa tops receiving the largest amounts. The frost-free season ranges from 150 to 200 days.

The principal source of precipitation is cyclonic thunderstorms which develop in the flow of moist air that moves into the area from the Gulf of Mexico during the summer months. Precipitation predominantly occurs as rainfalls of short duration and high intensity. Winter snowfall is minimal.

Geology and Topography

The White Canyon area is located on the western flank of the Monument Upwarp, a large structure extending from northern Arizona into southeastern Utah. The area consists of a gently westward-dipping plateau deeply cut by White, Red and Dark canyons and their tributaries. The tar sand deposit occurs on an isolated mesa bounded by Long and Short canyons on the southeast and by Fortknocker Canyon on the northwest.

The stratigraphy near the area of the tar sand deposit

includes the Permian Cutler, and the Triassic, Moenkopi and Chinle formations. The tar sand deposit is found in the basal Hoskinnini member of the Moenkopi formation. The Hoskinnini is a reddish-brown, poorly sorted, calcareous sandstone that forms vertical cliffs. It occupies from 0 to 480 feet below the surface. The rock weathers to a light-brown color in places with bituminous impregnations.

Minerals

TAR SAND: Little study and no comprehensive sampling have been completed on the tar sand deposit in the White Canyon area. The deposit is about 7 miles long and ranges from 1/2 to 1 mile in width. The Utah Geological and Mineralogical Survey designated the area a "zone of weak petroleum shows," and Ritzma (1979) estimated the resource as containing 12 to 15 million barrels of in-place oil. Overburden ranges from 0 to 480 feet in thickness. To date, there have been no expressions of interest submitted by industry, nor have lease tracts been identified within the White Canyon STSA. This indicates little interest in the deposit.

OTHER MINERAL RESOURCES: The White Canyon Mining District has produced copper and uranium from a few mines. Uranium prospecting continues within the White Canyon District. Areas are mined by underground methods. The known deposits of ore occurred in the Shinarump member of the Chinle formation above the tar sand deposits. No uranium or copper production is known to occur within the White Canyon STSA at present, although there are current mining claims recorded within its boundary. The claims are located in Township 34 South, Range 16 East, Sec. 29 & 31; and Township 35 South, Range 15 East, Sec. 8, 9, 11, 15, 17, 20, 21. There is a patented mining claim (1225478) in Township 35 South, Range 15 East, Sec. 8, which appears to be partly included with the STSA.

There is currently no production of oil and gas from any of the leases that lie within STSA. The portions of the STSA under lease are as follows:

Township 34 South, Range 15 East, Sec. 36

Township 34 South, Range 16 East, Sec. 28 & 32

Township 35 South, Range 15 East, Sec. 2 & 16

These leases would be eligible should the lessee apply for consideration of a CHL.

Soils

Over 60 percent of the STSA has shallow soils frequently occurring with exposures of rock outcrop on the mesa and along the rim of White Canyon. These soils are less than 20 inches deep, with sandy loam and sandy clay loam textures predominating. There are areas of very stony sandy loam and very sandy clay loam usually near canyon and mesa rims. Slopes range from 3 to 30 percent, but are generally less than 15 percent. Because of medium runoff, soil erosion is moderate.

About 20 percent of the lease area is composed of shallow to very deep soils on steep alluvial fans and escarpments below the mesa rim and canyon rims. These soils are generally very stony sandy loam and very stony sandy clay loam. Soil depths range from less than 20 inches near exposures of rock outcrop to more than 60 inches on alluvial fans. Slopes range from 30 to 70 percent. Extensive areas of rock

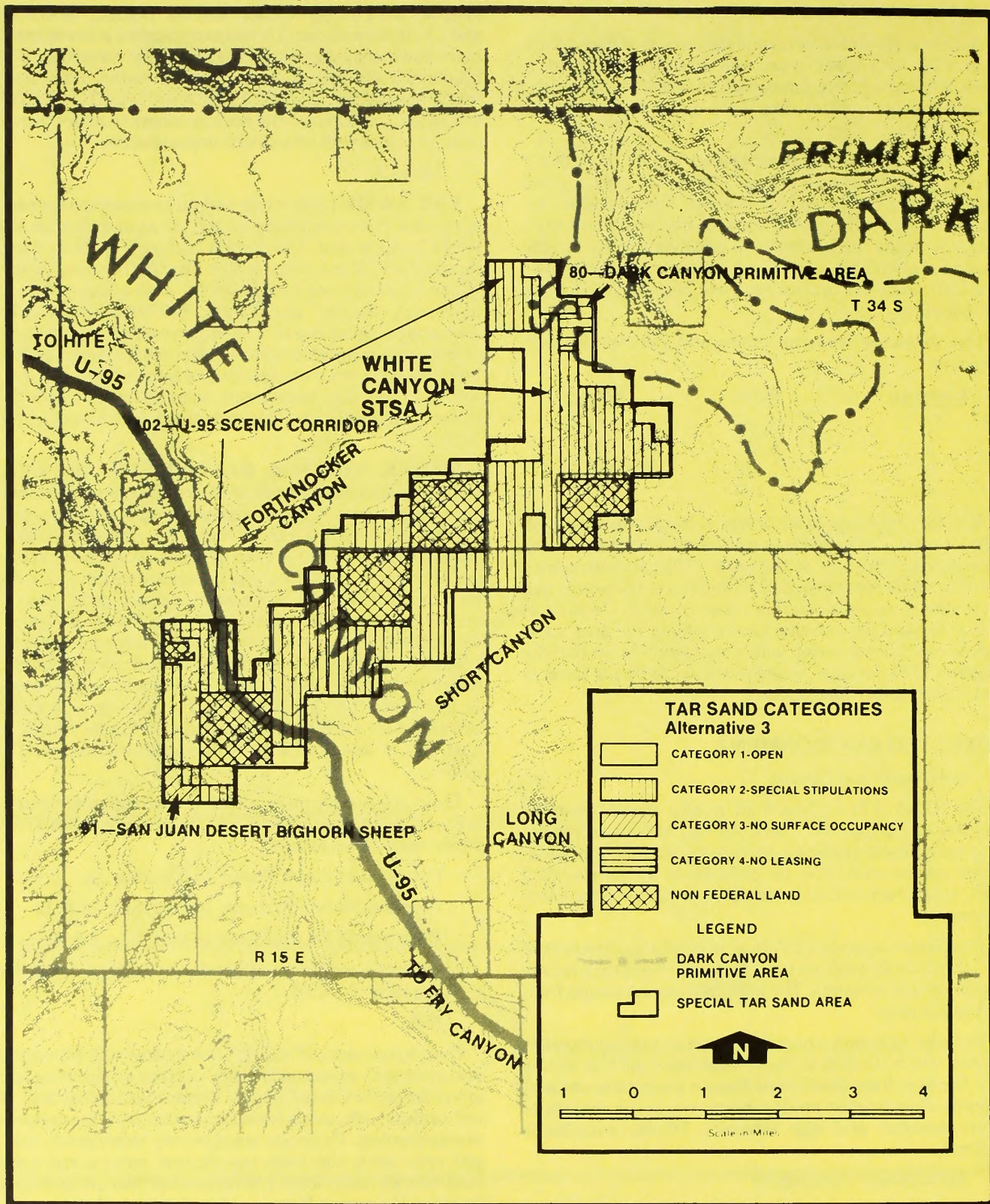


FIGURE 2-14
ALTERNATIVE 3, WHITE CANYON STSA

WHITE CANYON STSA

outcrop are associated with these soils and occur as nearly vertical cliffs, ledges, and slickrock. Because of rapid runoff, soil erosion is severe.

Less than 20 percent of the lease area is composed of deep and very deep soils on gently sloping alluvial fans and benches. They generally occur below the mesa above White Canyon, but also occur in small pockets on the mesa. These soils are generally fine sandy loam and are greater than 40 inches deep. Slopes are 1 to 8 percent. Because of slow runoff, soil erosion is slight. Under present conditions, soil losses from water erosion could be expected to range from less than 1/5 ton/acre/year up to 5 tons/acre/year.

Many of these soils are eolian. Sandy soils and those with fine sandy loam and very fine sandy loam textures predominate. These soils are subject to severe wind erosion when disturbed. Areas subject to direct wind action could experience soil losses in excess of 50 tons/acre/year if disturbed.

Vegetation

The vegetation on the mesa tops is sparse and includes scattered pinyon-juniper forest with cliffrose, Mormon tea, buffalo berry, blackbrush, rabbitbrush, and buckwheat. Grasses are practically absent on the mesa tops except along old mining roads where Indian ricegrass and needle-and-thread grass are found. The remainder of the STSA is a desert shrub community consisting of blackbrush, fourwing saltbush, desert holly, pinyon, juniper, curly grass, Indian ricegrass, and sand dropseed. There are no known threatened or endangered plant species in the STSA.

Water Resources

The only live water in the STSA is a single spring in Short Canyon. This is a developed spring with a collection system and water trough. Production is approximately 8 gallons per minute. It is located in an area below the tar sand deposits. Three or four inoperative livestock reservoirs are found within the STSA.

Wildlife

The White Canyon STSA is within the White Canyon-Red Canyon Desert Bighorn Sheep Habitat Management Area. This area is yearlong desert bighorn sheep habitat and is used during various periods of the year, depending mainly on the availability of water. The southwest corner of the STSA contains crucial yearlong bighorn sheep habitat. The STSA is within UDWR's South San Juan bighorn sheep hunting unit. The STSA is in deer herd unit 31B. Most of the deer use occurs during the winter months. Raptor nesting sites have not been identified, although mourning dove probably nest in the area. Chukar partridge may also use portions of the area.

ENDANGERED SPECIES: Bald eagles are winter transients in the area; no roosting sites for this species have been identified.

Livestock and Agriculture

The STSA is within the White Canyon Grazing Allotment and provides less than 0.5 percent of the 5,544 AUMs in the allotment. Grazing is by cattle, primarily in the winter from November 1 through March 31. Most grazing takes place on the benches adjacent to canyons. Some grazing also occurs on mesa tops, but forage in this area is limited and consists mostly of browse. Livestock carrying capacity on the mesa tops is estimated at 200+ acres per AUM; carrying

capacity on the benches is 20+ acres per AUM. There is no agricultural development on the STSA.

Visual Resources

The White Canyon STSA occurs in the lower part of White Canyon. The canyon is about 6 miles wide near the STSA. The floor of the canyon is formed by the uppermost part of the resistant, light-colored Cedar Mesa sandstone member of the Cutler formation. The floor slopes gently to the west. The sides of the canyon "stairstep" and were eroded from dominantly reddish rocks of Triassic and Jurassic ages. The dominant topographic feature of the STSA is a peninsula that extends southwestward from the east side for almost the entire distance across the canyon.

Scattered low shrubs (less than 3 feet tall) form the dominant vegetation. Their gray-green color forms a striking contrast with the reddish-colored Triassic and Jurassic rocks. Pinyon-juniper woodland grows on the higher portions of the STSA.

The lease area was inventoried and evaluated using BLM's VRM system in 1978. The objective of the visual resource inventory and evaluation process is to classify visual resources according to the cultural modifications present, the inherent scenic quality, the number of people who see them, their attitudes toward alteration of the landscape (visual sensitivity), and the distance from viewers. Based on this evaluation, areas are assigned VRM classes. Management objectives for each class are designed to maintain or enhance visual quality. The majority of the area is in VRM Class II. In this class, a management activity may be seen but should not attract attention or be a dominant feature of the landscape in terms of scale; however, the change should repeat the basic elements inherent in the landscape.

An interagency study group composed of Federal, State, and county representatives has developed a plan for management of the Highway U-95 corridor. That plan made two recommendations for preservation of visual resources.

Cultural Resources

Some inventories have been conducted in the general vicinity of the White Canyon STSA, primarily related to uranium exploration and development. In 1978, an aerial survey of 500 acres was conducted near the Happy Jack Mine at the southwestern corner of the STSA. Six prehistoric sites were located--five artifact (lithic) scatters and one campsite, all of which are of a Pueblo II cultural affiliation. In 1979, another large areal survey of 530 acres was conducted in the Jacob Chair locale. Twelve prehistoric sites were located--10 artifact (lithic) scatters, one quarry, and one camp. Only the quarry could be assigned a cultural affiliation. A gypsum point found at this site led to a late Archaic designation. In addition to the uranium-related inventories, another areal survey was conducted in the Horse Flats locale in 1969 for a chaining project. Thirteen prehistoric sites were located, most of which are Pueblo II and III habitation sites. Because of the relative difficulty of access to this country, the White Canyon STSA potentially contains numerous pristine cultural resources. Although the literature search revealed no recorded sites, it is likely that Archaic through historic peoples occupied this area, with Pueblo cultural manifestations predominating. A large amount of material is potentially available for scientific study.

CHAP 2: ALTERNATIVE EVALUATIONS

There are no existing National Register sites or nominations in the White Canyon STSA. However, potential National Register quality sites may be located here.

Recreation

Recreational opportunities, including hiking, sightseeing and photography, are present. However, present use is largely limited to those activities by travelers of Highway U-95. Most of the travel is enroute to and associated with recreation use at Lake Powell.

The White Canyon STSA is within the South San Juan hunting unit, which has been closed to deer hunting since 1980. Five hunting permits for bighorn sheep are issued annually; most of this activity occurs in the Red Canyon area, south of the STSA. Other hunting activity is considered negligible.

Wilderness

A small portion of the Dark Canyon ISA is located in the STSA (40 acres in Township 34 South, Range 16 East, Sec. 17, NE $\frac{1}{4}$). Impacts to wilderness values in these areas could not occur, as any lease issued would be under IMP and would be subject to strict nonimpairment standards. Any surface-disturbing activities would have to be temporary in nature and capable of being reclaimed to a point of being substantially unnoticeable by 1991.

Land Uses and Land Use Plans

The principal land uses in the STSA are transportation, watershed, grazing, recreation, and some limited minerals development. There is a State of Utah selection application (U-7284), which is expected to be relinquished, Township 35 South, Range 15 East, Sec. 8, NE $\frac{1}{4}$ NE $\frac{1}{4}$. Also in the same section are lands patented under a mineral survey for the Happy Jack Mine. A right-of-way for Highway U-95 to UDOT encumbers a linear portion through Township 35 West, Range 15 East, Sec. 9 and 17. There are no other land permits, licenses, grants, or easements in the area other than the grazing permits issued to livestock permittee (see Livestock and Agriculture section).

Socioeconomics

The STSA is located in west-central San Juan County. San Juan County and, in particular, the Town of Blanding (65 road miles east of the STSA), would be most affected if the STSA were developed. Other areas which could be affected include: Hanksville (65 road miles northwest of the STSA), Hite Marina (20 miles northwest of the STSA), and Fry Canyon (5 miles east of the STSA).

San Juan County can be summarized as rural; the majority of the county is unpopulated. Mining accounts for the majority of jobs in the county and has suffered from significant unemployment as a part of a nationwide recession and a downturn in local uranium mining and milling. San Juan County had a 1981 population of 12,700, not quite 1 percent of the State population. The county has two service centers: Monticello, the county seat, had a 1980 population of 1,930 and Blanding, about 20 miles south, had a 1980 population of 3,120. San Juan County is one of the largest in Utah, comprising 7,885 square miles (about the size of New Jersey). About 85 percent of the county is owned by the Federal government, 6 percent by the State of Utah, and 8 percent is in private ownership.

Recent statistics indicate that mining accounts directly

for almost half of the income and over 30 percent of the employment in the county (see Table 2-9). Government and tourism are San Juan County's next most important sources of employment and income. Unemployment in the county is high, over 9 percent. In addition, about 20 percent of county residents are on welfare and do not appear in unemployment statistics. The percentage of employed people is greater on the Indian Reservation.

Because of available services and labor force, most work force requirements for tar sand developments in the STSA would come from Blanding. Blanding is the largest town in San Juan County. Its economy is based on mining, milling, tourism, and the College of Eastern Utah. During the 1970's Blanding had the highest growth rate in the county, which strained housing and infrastructure. The current slump in the uranium industry has halted growth and caused a significant increase in local unemployment rates.

Hanksville is a small community (population under 1,000) located 65 miles northwest of the STSA boundary. It has few services besides several gas stations, a general store, and a restaurant. Major local employers include government, mining, and agriculture. Most of the mining jobs are located outside of Wayne County. Recent layoffs in the uranium industry have had a significant impact on the community, and local unemployment rates are high.

Hite Marina has undeveloped camping areas, basic utilities, housing for concessionaires and National Park Service (NPS) personnel, and a general store. There are plans to expand the existing utility systems and to construct a developed campground, hotel, and restaurant. Fry Canyon is a combination gas station, motel, and bar and is seasonally open for business.

Past activities of some local economic consequence in the STSA include mineral production, livestock production, and recreation. Relevant cultural and lifestyle values in San Juan County include a strong emphasis on economic progress, resource development, local government, and local control. The great disparity between Federal and private land ownership has frustrated local control of the area's resources and has contributed to local distrust of Federal agencies.

ENVIRONMENTAL CONSEQUENCES

Tar Sand Resources

ALTERNATIVE 1, NO ACTION/MAXIMUM DEVELOPMENT: All but 240 acres of the STSA would be open to tar sand leasing and surface occupancy. However, even in category 1 (open to leasing) a plan of operation must be approved by BLM. That approval process places constraints and stipulations on operational activities to protect environmental concerns. However, these constraints cannot be determined at this time and are outside the scope of leasing category development.

ALTERNATIVE 2, MULTIPLE USE (PREFERRED ALTERNATIVE): Approximately 97 percent of the STSA would be in categories 1 and 2 (see Figure 2-12) and would be available for tar sand leasing and subsequent development. Categories 3 and 4, which restrict leasing or surface occupancy, would only apply to 240 acres of the entire STSA.

The U-95 scenic corridor (see Figure 2-12) category 2

TABLE 2-9

Wage, Salary, Employment, and Income Data
for San Juan County in 1980

Type	<u>Income</u> (dollars)	<u>Employment</u> (jobs)
Total Employment and Income	\$57,596,000	3,995
Unemployment (3rd Qtr 1982)		9.7%
	<u>Percent</u>	<u>Percent</u>
Agriculture	4	4
Non Agriculture	96	96
Private Industry	79	70
Mining	48	33
Construction	6	4
Manufacturing	4	5
Trans. and Public Utilities	5	5
Retail Trade	5	8
Services	8	11
Other	3	4
Government	17	26
Federal	2	4
State and Local	15	22

Source: USDC, 1981; UDES, 1982.

Note: The employment percentage figures do not include proprietors' employment and, therefore, underestimate the relative importance of agriculture. Totals may not be additive because of rounding.

area would place significant restrictions on potential development within the U-95 viewing area. All visual impacts from tar sand development could not be seen from the highway. This restriction would limit mining activities on approximately 2,340 acres (29 percent) of the STSA.

ALTERNATIVE 3, RESOURCE PROTECTION: Impacts would be identical to those occurring under Alternative 2.

Other Mineral Resources

There would be no impact on the production potential of oil and gas leases within the STSA, except that some of those leases could be eligible for conversion to CHLs which could enhance their production capabilities. If the area were mined either by stripping or underground methods, surface production from strata underlying the Moenkopi formation could be seriously hindered or prevented for at least the duration of tar sand mining.

Uranium mining activity generally occurs in the Chinle shale, which lies directly above the tar sand deposits in the stratigraphic section. Uranium mining within the STSA would be curtailed by either the stripping or underground extraction of the tar sand deposit because of this close proximity.

ALTERNATIVES 1, 2, AND 3: Impacts would be similar to those mentioned above.

Wilderness Values

No impacts to wilderness were identified.

Other Resource Values and Uses

AIR QUALITY: Surface mining could degrade air quality if overburden were removed with high explosives. A large plume of particulates normally rises several hundred feet into the air during such removal. The effect on air quality would depend upon: (1) type of overburden; (2) technique used in blasting; and (3) surface winds. In-situ development would require heating of tar sand. The method of heating would cause impacts to air quality. Other impacts to air quality include fugitive dust along roads, vehicle emissions, and possible processing plant emissions. Impacts beyond this level will be discussed in a site-specific analyses and plan of operation should a proposal be received. Also, impacts are further discussed in Volume I of this EIS.

Alternatives 1, 2, and 3: All of the above-mentioned impacts could occur.

GEOLOGY AND TOPOGRAPHY: Surface mining would cause major alterations in local topography. Overburden would range from 0 to 480 feet thick. Disposal of waste rock and tailings could create hills or mounds or be used to fill in drainages. In-situ mining would have no major effect on geology or topography except for possible subsidence. Subsidence would be limited to a few feet.

Alternatives 1, 2, and 3: All of the above-mentioned impacts could occur.

SOILS: Erosion could be expected to increase with tar sand development because of surface disturbance. This would increase salt and sediment yields in the Colorado River system. The amount of accelerated erosion would depend on the area and soil types affected by development. Most soil losses would occur on the steep alluvial fans and

escarpments below the mesa and canyon rims. Losses from shallow soils on the sloping mesa top and near the rims of the canyons could be expected to be less than 5 tons/acre/year. Soil losses from wind on the steep canyon and mesa slopes could exceed 50 tons/acre/year where they were disturbed. Soil losses from wind on the deep and very deep soils on gently sloping alluvial fans and benches would be less than 1 ton/acre/year.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur throughout the STSA (more than 95 percent). Approximately 280 acres in categories 3 and 4 would not be subject to these impacts (see Figure 2-12).

Alternative 2, Multiple Use (Preferred Alternative): All of the above-mentioned impacts could occur on 38 percent of the STSA (3,078 acres). However, the category 2 stipulations on 58 percent of the STSA (4,727 acres) along the Highway U-95 corridor would reduce soil erosion by limiting mining activities.

Alternative 3, Multiple Use: All of the above-mentioned impacts could occur on 24 percent of the STSA (1,924 acres). However, category 2 stipulations on 73 percent of the STSA (5,881 acres) along the Highway U-95 corridor would reduce soil erosion by limiting mining activities.

VEGETATION: Vegetation would be destroyed by strip mining. In-situ mining would produce similar impacts where roads, pads, and other facilities were placed. The mined areas could probably be rehabilitated and restored to a more diverse and productive vegetative cover than the present cover because past grazing use has led to a pinyon-juniper climax community with little or no understory. Grasses would be the biggest increaser in the rehabilitated areas, while species such as blackbrush, pinyon, and juniper would be more difficult or impossible to reestablish.

Success of revegetation on disturbed areas would probably be poor because of the extent of shallow soils and relatively low annual precipitation. Where deep or very deep soils were available, seeding success would be fair.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur throughout 95 percent of the STSA except for category 3 and 4 areas (see Figure 2-12).

Alternative 2, Multiple Use (Preferred Alternative): All of the category 1 areas, approximately 38 percent of the STSA (see Figure 2-12), would be subjected to the impacts discussed above. The mesa top in category 2 would be the only area open to mining and development because of the Highway U-95 corridor stipulation.

Alternative 3, Resource Protection: This alternative would place 73 percent of the STSA in category 2, with seasonal stipulations on tar sand exploration activity and a year-round stipulation along the Highway U-95 corridor. These stipulations would produce about the same effect to vegetation as those occurring under Alternative 2.

WATER RESOURCES: The spring in Short Canyon would probably not be impacted. However, tar sand development could alter runoff patterns in all alternatives.

WILDLIFE: Current information indicates that desert bighorn sheep are usually displaced by human disturbances, even though the crucial yearlong bighorn sheep habitat

would be protected. Mining activity on the mesa and points above Short Canyon would probably disrupt bighorn sheep movements in that area. Bighorn sheep would be displaced from the mesa during the life of any tar sand mining operations. A seasonal stipulation to avoid mining exploration during bighorn sheep lambing periods (April 2 through June 30) would lessen adverse impacts on bighorn sheep during this critical period. Impacts would not be expected to bald eagles or other wildlife species.

Alternative 1, No Action/Maximum Development: All impacts discussed above could occur. However, some protection to bighorn sheep habitat would occur because 120 acres would be placed in category 3 (see Figure 2-12).

Alternative 2, Multiple Use (Preferred Alternative): This alternative would avoid displacement impacts to bighorn sheep. Category 2 areas (see Figure 2-12) would place seasonal restrictions on tar sand exploration activity, which would reduce conflicts during the critical lambing period. This would apply to 59 percent of the STSA. However, mining would disrupt bighorn sheep movement in the entire area.

Alternative 3, Resource Protection: This alternative would place more acreage in category 2 (approximately 73 percent) (see Figure 2-14) with a seasonal stipulation on lambing. Other impacts would be similar to Alternative 2.

LIVESTOCK AND AGRICULTURE: Tar sand development would have little negative impact on livestock grazing, since forage loss would be a small part of the total forage available in the affected allotment. If the mesa tops are rated at 200+ acres per AUM on approximately 5,000 acres, that amounts to less than 25 AUMs of livestock forage. Less than 0.5 percent of the 5,544 AUMs in the allotment is in the area underlain by tar sand. If rehabilitation efforts were successful in establishing useable forage after mining was completed, the livestock permittee could experience a positive impact from improved forage production.

Alternatives 1, 2, and 3: Impacts would be the same as those mentioned above.

VISUAL RESOURCES: Any hydrocarbon development within the Highway U-95 visual corridor would produce a significant visual intrusion into an otherwise nearly pristine viewing area. Road construction on steep slopes along the mesa slopes could create cut and fill slopes up to several hundred feet high. These faces would look raw and readily noticeable to passing motorists.

Mining activities would produce the same effect, but potentially on a much larger scale. Mining, especially surface mining, could alter the form and texture of the scenery. Dump piles and cut faces could become permanent aspects of the viewing area. In-situ mining would not alter the landscape by removing vegetation with roads and pads. However, the area would be scattered with pump jacks, wellheads, pipelines, and storage tanks.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur.

Alternative 2, Multiple Use (Preferred Alternative): This alternative would protect the Highway U-95 visual corridor and VRM Class II area within 2 miles of Highway U-95 from significant surface-disturbing activities such as surface mining. Mining could occur in the VRM Class II areas beyond 2

miles of Highway U-95. Potential does exist for changes in the basic form, line, and color of the existing landscape to exceed that allowable for VRM Class II areas in 38 percent of the STSA (3,078 acres). The same is true for VRM Class IV areas.

Alternative 3, Resource Protection: Impacts would be similar to Alternative 2, because the Highway U-95 viewing area stipulation in category 2 areas would have protected the visual quality except in 23 percent of the STSA.

CULTURAL RESOURCES: Cultural resource inventories must be conducted prior to any surface disturbance, as discussed in the Introduction to this chapter. Normally, mitigation of primary impacts to archaeology is in the form of avoidance; salvage is used when there is no other available option. Tar sand mining would make avoidance difficult. The result would be loss of an undetermined amount of archaeological resources and their scientific value. However, secondary impacts caused by increased human activities (i.e., vandalism) could not be avoided.

Alternative 1, No Action/Maximum Development: All of the above-mentioned primary impacts could occur. Secondary impacts would occur in the San Juan bighorn sheep and the Dark Canyon Primitive areas, which are in categories 3 and 4.

Alternative 2, Multiple Use (Preferred Alternative): All of the above-mentioned impacts could occur, although these impacts would be limited to areas open to surface occupancy. The Highway U-95 scenic corridor, the San Juan bighorn sheep hunting unit, and the Dark Canyon Primitive Area would not be subjected to any impacts to archaeological resources. This would limit impacts to approximately 43 percent of the STSA; however, secondary impacts would occur.

Alternative 3, Resource Protection: The impacts mentioned above would not occur on approximately 43 percent of the STSA. An undetermined amount of the remaining percentage in category 2 would be closed to mining if viewed from Highway U-95. This would protect archaeological resources in those areas from primary impacts. The remaining 24 percent would be in category 1 and would be subject to all the impacts discussed above.

RECREATION: The quality of sightseeing opportunity would be degraded if mining occurred within the visual corridor along U-95 (see Visual Resources section). Because the deer herd has been closed to hunting since 1980 and allowable hunting occurs south of the STSA, no impact to hunting is expected to occur.

Alternative 1, No Action/Maximum Development: The impacts mentioned above would occur.

Alternatives 2 and 3: All impacts to recreation would be avoided.

LAND USES AND LAND USE PLANS: Impacts to future development of the Happy Jack Mine are not anticipated on non-Federal parcels. Development of adjacent Federal lands could be curtailed or foregone if tar sand development occurred. The right-of-way for Highway U-95 would probably be protected from tar sand development in the STSA.

Alternatives 1, 2, and 3: Same as impacts mentioned above.

CHAP 2: ALTERNATIVE EVALUATIONS

SOCIOECONOMICS: Based upon existing technology, in-place tar sand quality and quantity, known and better tar sand reserves elsewhere, and lack of industry interest in the area, no production is expected from the

STSA; therefore, there would be no work force requirements and no socioeconomic impacts under any of the proposed alternatives.

CEDAR CITY DISTRICT

Circle Cliffs STSA

MAJOR ISSUES

The following major issues were identified for tar sand development in the Circle Cliffs STSA:

- *Capitol Reef National Park:* Approximately 30,720 acres of Capitol Reef National Park (NPS and State lands) lie within the STSA. While there would not be any leasing within the Park, it does share a 22-mile-long border with areas having potential for tar sand development, much of which may be surface minable. Major concerns expressed include watershed contamination, impacts to Class I air quality areas, and secondary impacts associated with large commercial development (ORV use, hunting, trespassing, and destruction of archaeological values within the Park). NPS is concerned about certain areas on the east flank of the STSA which lie on water courses draining into the Park: surface mining in this area could impair downstream Park resources.
- *Natural Areas:* There are two natural areas within the STSA: (1) Wolverine Petrified Wood Natural Area (1,120 acres); and (2) Escalante Canyons Outstanding Natural Area (360 acres). The development of tar sand could impact the natural and scientific qualities within these areas.
- *Recreation and Visual Resources:* The STSA lies within Circle Cliffs, a scenic portion of the Colorado Plateau. Much of the STSA consists of good to outstanding scenery and is included in VRM Classes I and II. Tar sand development in the STSA could be seen by an estimated 5,000 people per year traveling on the Burr Trail. Use of the Burr Trail, predominantly for recreational activities, would be affected by increased industrial and commercial traffic associated with tar sand development. Conflicts with recreational uses (i.e., rockhounding, backpacking, day hiking, sightseeing, and photography) within the Canyons of the Escalante Cooperative Management Area (CMA) would be probable from tar sand development.

ALTERNATIVES

Alternative 1: No Action/Existing Oil and Gas Categories

The No Action Alternative would retain the existing oil and gas category system for competitive CHLs and conversions (see Figure 2-15). Present categories consider only impacts resulting from oil and gas exploration and development. The entire STSA would remain in category 1 (open to leasing subject to standard surface disturbance stipulations as contained in Appendix 1) except for the Wolverine Petrified Wood Natural Area, which would remain in category 3 (no surface occupancy). Oil and gas production and tar sand exploration and development could occur on all but 1,120 acres of the STSA under BLM surface management. Mitigation would be accomplished to the extent proposed upon review of APDs, exploration plans, and plans of operation in category 1 areas. Stipulations for category 3

areas would be as follows:

Wolverine Petrified Wood Natural Area (Category 3, 1,120 Acres).

Township 34 South, Range 6 East, Sec. 35 E $\frac{1}{2}$, E $\frac{1}{2}$ W $\frac{1}{2}$;

Township 35 South, Range 6 East, Sec. 1.

Alternative 2: Maximum Development

The Maximum Development Alternative would subject all lands within the STSA to category 1 (see Figure 2-15). Oil and gas production and tar sand exploration and development could occur on all 50,760 acres of the STSA under BLM surface management. Mitigation would be accomplished to the extent proposed upon review of APDs, exploration plans, and plans of operation.

Alternative 3: Multiple Use (Preferred Alternative)

This alternative would attempt to balance tar sand development with other resource uses. No attempt would be made to completely protect other resources, and/or resource uses from the effects of tar sand development, nor would full tar sand development be allowed. Rather, each sensitive resource value would be compared with the potential for tar sand development. The least restrictive category providing the minimum protection necessary for other resource values was chosen.

The proposed categories and areas with special resource values are shown on Figure 2-16. The following lists the categories and approximate acres.

Category	Acres	Percent
1	34,800	69
2	14,480	29
3	1,480	2

Each area containing special values is listed below, together with the proposed category and any applicable stipulations:

Escalante Canyon Outstanding Natural Areas (Category 3, 360 Acres).

Township 35 South, Range 7 East, Sec. 34, SE $\frac{1}{4}$ SE $\frac{1}{4}$;
Sec. 35, SE $\frac{1}{4}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ S $\frac{1}{2}$, N $\frac{1}{2}$ SE $\frac{1}{4}$.

The Escalante Canyons Outstanding Natural Area was designated by Executive Order U-8742 (December 7, 1982) to preserve its scenic and natural values (see Figure 2-17). The development of oil, gas, and tar sand, by either in-situ or surface-mining methods, would destroy these values. However, it is unlikely that much tar sand would be developed in this area because it is located outside the known tar sand deposit.

Wolverine Petrified Wood Natural Area (Category 3, 1,120 Acres).

Township 34 South, Range 6 East, Sec. 35, E $\frac{1}{2}$ E $\frac{1}{2}$ W $\frac{1}{2}$;

Township 35 South, Range 6 East, Sec. 1.

The Wolverine Petrified Wood Natural Area was withdrawn under Executive Order 10355 (May 26, 1952) (see Figure 2-17). It is segregated from public sale, agricultural entry, and location under the mining laws to protect the petrified wood in the area for observation and scientific interest. This area contains a greater concentration of petrified wood than found elsewhere in the Circle Cliffs area; much of this wood is exposed. Some wood is up to 100 feet in length and 3 feet in diameter. In many other places, petrified wood is rapidly being depleted on public lands. The

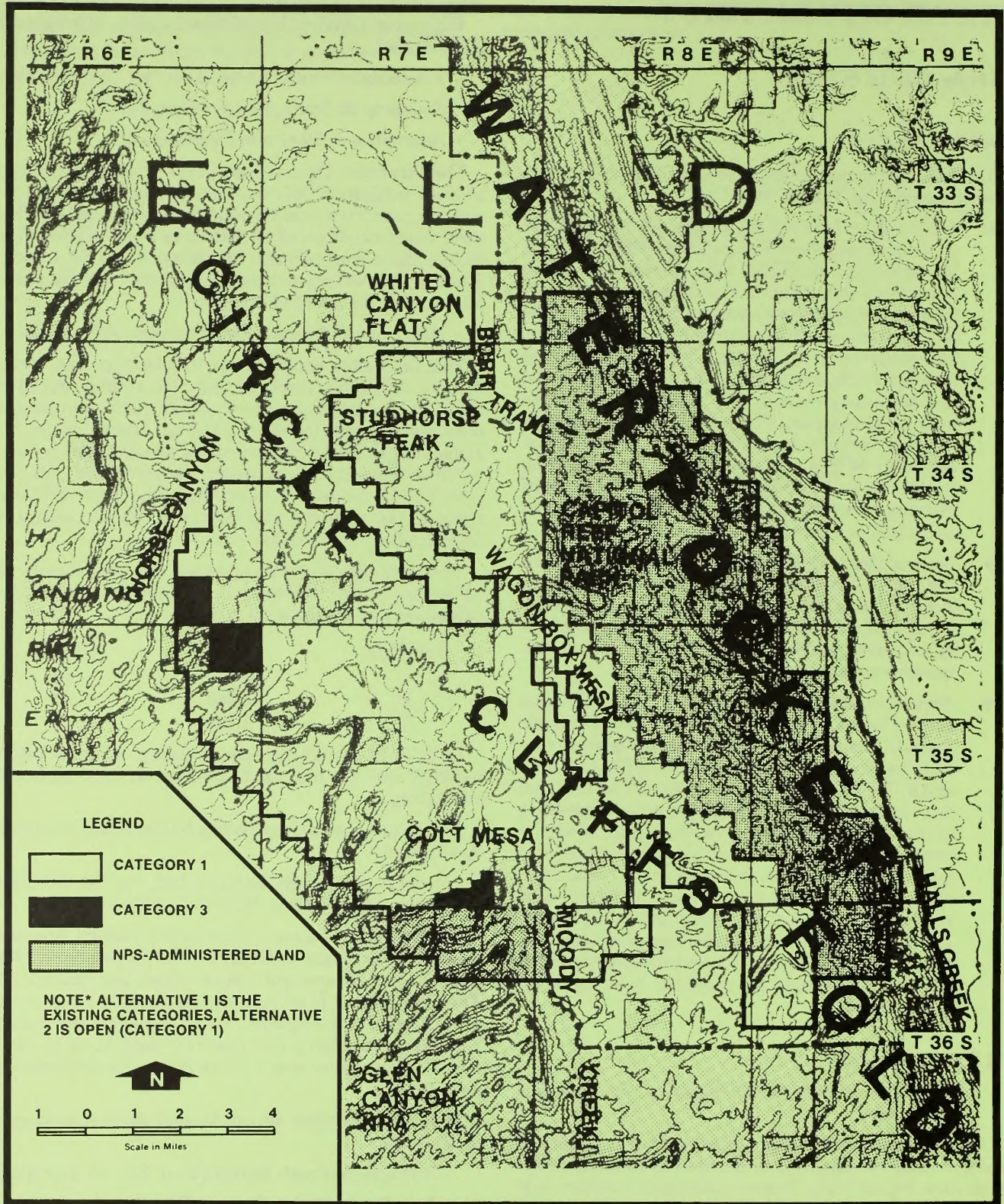


FIGURE 2-15
ALTERNATIVES 1 AND 2
CIRCLE CLIFFS STSA

CIRCLE CLIFFS STSA

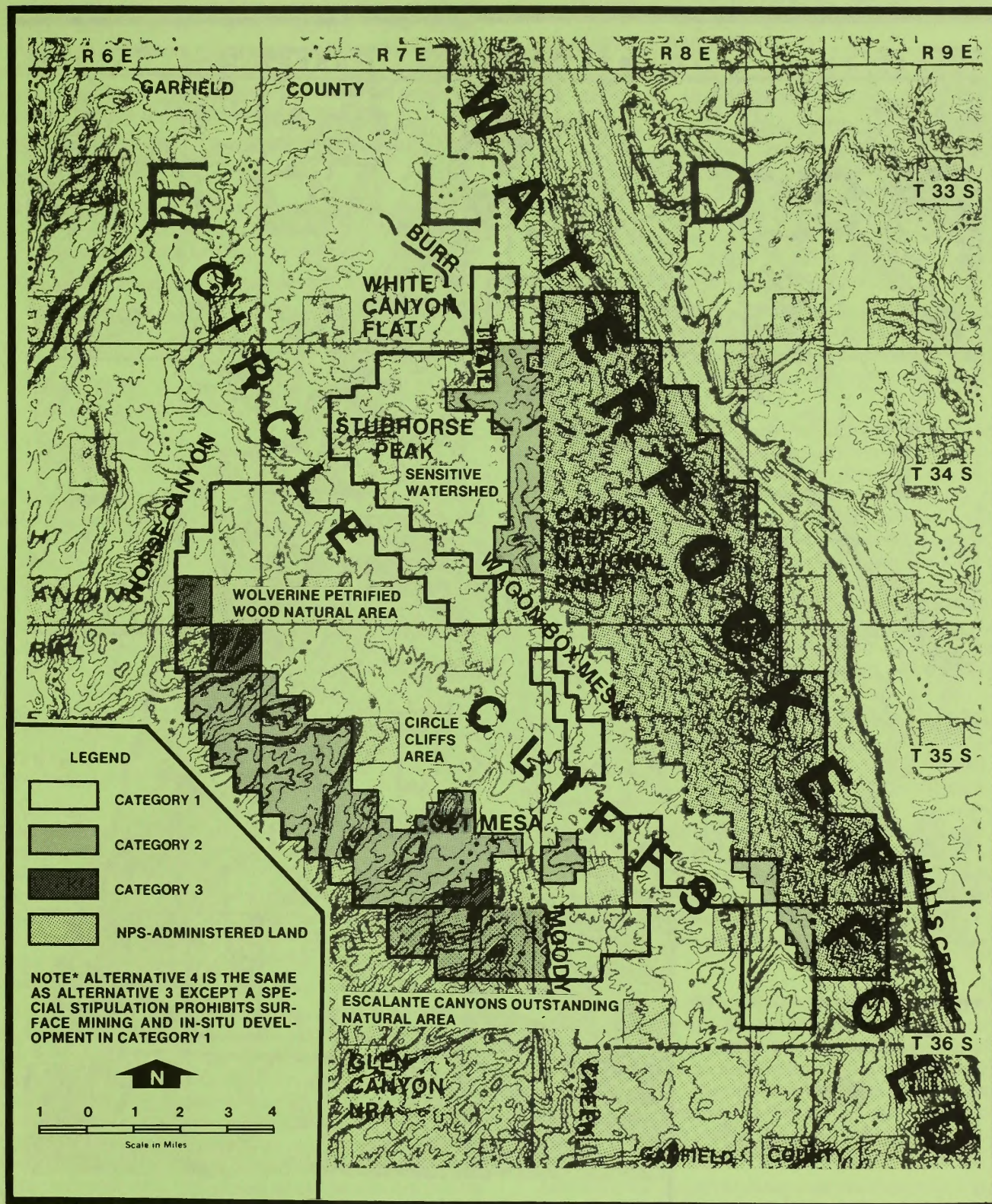


FIGURE 2-16
ALTERNATIVES 3 AND 4
CIRCLE CLIFFS STSA

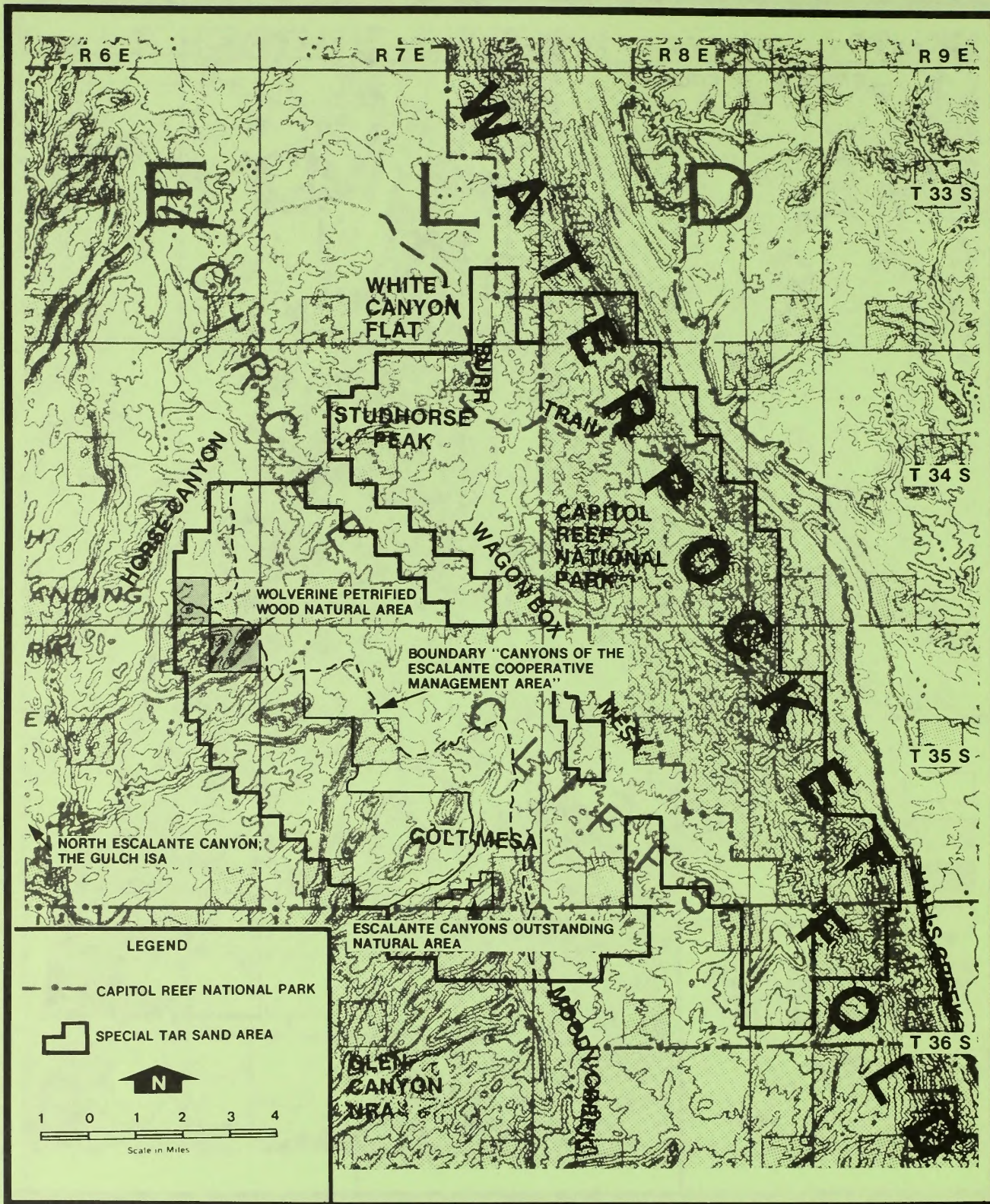


FIGURE 2-17
RECREATION RESOURCES
CIRCLE CLIFFS STSA

CIRCLE CLIFFS STSA

development of oil, gas, and tar sand, by either in-situ or surface-mining methods, would destroy these values.

An unknown amount of tar sand would be affected. This area is situated along the westernmost edge of the deposit where the occurrence of tar sand is considered much less favorable than to the east (see Figure 2-18).

Sensitive Watershed (Category 2, 3,240 Acres).

Stipulation:

- No surface mining of tar sand deposits is allowed on this lease. The tar sand may be extracted by in-situ or underground mining methods only.

This stipulation applies to the following areas:

Township 34 South, Range 7 East, Sec. 1, all; Sec. 11, N $\frac{1}{2}$; Sec. 12, all; Sec. 13, E $\frac{1}{2}$ E $\frac{1}{2}$ W $\frac{1}{2}$; Sec. 24, E $\frac{1}{2}$ E $\frac{1}{2}$ W $\frac{1}{2}$

Township 35 South, Range 8 East, Sec. 35, E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$

Township 36 South, Range 8 East, Sec. 1, E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 12, NE $\frac{1}{4}$ NE $\frac{1}{4}$.

Approximately 675 acres of sensitive watershed are underlain by tar sand which could be surface mined (see Figure 2-19). These sensitive watershed areas drain into Capitol Reef National Park. NPS has expressed concern that surface mining impacts in these areas would degrade Park resources in downstream areas and has requested that these drainage areas be designated as no surface occupancy. Increased silt loading and impairment of water quality would result if major upstream surface disturbance occurred under category 1. It is unknown what impacts in-situ development of tar sand would have on downstream Park resources. However, impacts from in-situ mining are generally considered less severe than impacts resulting from surface mining.

A category 2 designation on sensitive watershed areas stipulating no surface mining would eliminate impacts from surface mining; however, oil, gas, and in-situ tar sand development would be allowed. A category 2 designation stipulating no surface or in-situ development would eliminate both surface mining impacts and possible impacts occurring from in-situ development. A category 3 designation would prohibit surface occupancy for oil, gas, and tar sand development.

There is no indication that oil and gas development would impact downstream Park resources nor has it been shown that prohibition of in-situ development would protect downstream Park resources. The category 2 stipulation prohibiting surface mining only for tar sand represents the least restrictive stipulation while providing the minimum protection necessary for Park resources and allowing for some tar sand development. Eight percent of the potential surface minable area (675 acres) would be affected by this stipulation.

Circle Cliffs (Category 2, 11,240 Acres).

Stipulation:

- No surface mining of tar sand deposits is allowed on this lease. The tar sand may be extracted by in-situ or underground mining methods only.

This stipulation applies to the following areas:

Township 34 South, Range 7 East, Sec. 25, E $\frac{1}{2}$, NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$

Township 35 South, Range 8 East, Sec. 30, SW $\frac{1}{4}$ SW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 31, N $\frac{1}{2}$ N $\frac{1}{2}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$

Township 35 South, Range 6 East, Sec. 11, E $\frac{1}{2}$; Sec. 12, all; Sec. 13, all; Sec. 14, E $\frac{1}{2}$ NE $\frac{1}{4}$; Sec. 24, NE $\frac{1}{4}$

Township 35 South, Range 7 East, Sec. 7, W $\frac{1}{2}$ NW $\frac{1}{4}$, S $\frac{1}{2}$; Sec. 17, all; Sec. 18, all; Sec. 19, all; Sec. 20, all; Sec. 21, SW $\frac{1}{4}$; Sec. 22, E $\frac{1}{2}$ SE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 23, SW $\frac{1}{4}$; Sec. 25, SW $\frac{1}{4}$; Sec. 26, NW $\frac{1}{4}$, S $\frac{1}{2}$; Sec. 27, E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$; Sec. 28, SE $\frac{1}{4}$ NE $\frac{1}{4}$, W $\frac{1}{2}$, SE $\frac{1}{4}$; Sec. 29, all; Sec. 30, NE $\frac{1}{4}$; Sec. 33, all; Sec. 34, N $\frac{1}{2}$, SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 35, N $\frac{1}{2}$ N $\frac{1}{2}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$.

The STSA lies within a scenic portion of the Colorado Plateau known as the Circle Cliffs. Approximately 11,000 acres of the STSA consist of good to outstanding scenery and are VRM Class I and II areas. (Figure 2-20 shows VRM classes for the STSA.)

Visual resources in the northeast and southwest portions of the VRM Class I and II areas would be impacted most by tar sand development. Conflicts with recreational uses (i.e., rockhounding, backpacking, day hiking, sightseeing, and photography) within the Canyons of the Escalante CMA would be probable with tar sand development. It is anticipated that 6,000 people would be impacted by development in this area annually. A category 1 designation would not adequately protect visual resources. Surface mining could occur wherever technologically feasible. A category 2 designation stipulating no surface mining would eliminate impacts occurring from surface mining but would allow oil, gas, and in-situ tar sand development.

There is no evidence that oil and gas development would have long-range effects on visual qualities or resource uses. Impacts from in-situ development would last around 30 years. The category 2 stipulation, which would prohibit surface mining only for tar sand, represents the least restrictive stipulation while providing the minimum protection necessary for other resource values and allowing for some development of tar sand. Seven percent of the identified potential surface minable area (about 625 acres) would be affected by this stipulation.

Alternative 4: Restricted Development (Resource Protection)

This alternative places more priority on protection of sensitive resource values than Alternative 3. Categories and stipulations would allow tar sand development while providing additional protection for special resource values (see Alternative 3). The primary difference between Alternative 4 and Alternative 3 is that the category 2 area protected from surface mining impacts would be further protected from impacts resulting from in-situ development.

Locations for proposed categories are shown on Figure 2-16, and a more detailed description is given in Alternative 3 above. The following lists the categories and approximate acres. (Category 2 areas would be open to oil and gas development only.)

Category	Acres	Percent
1	34,800	69
2	14,480	29
3	1,480	2

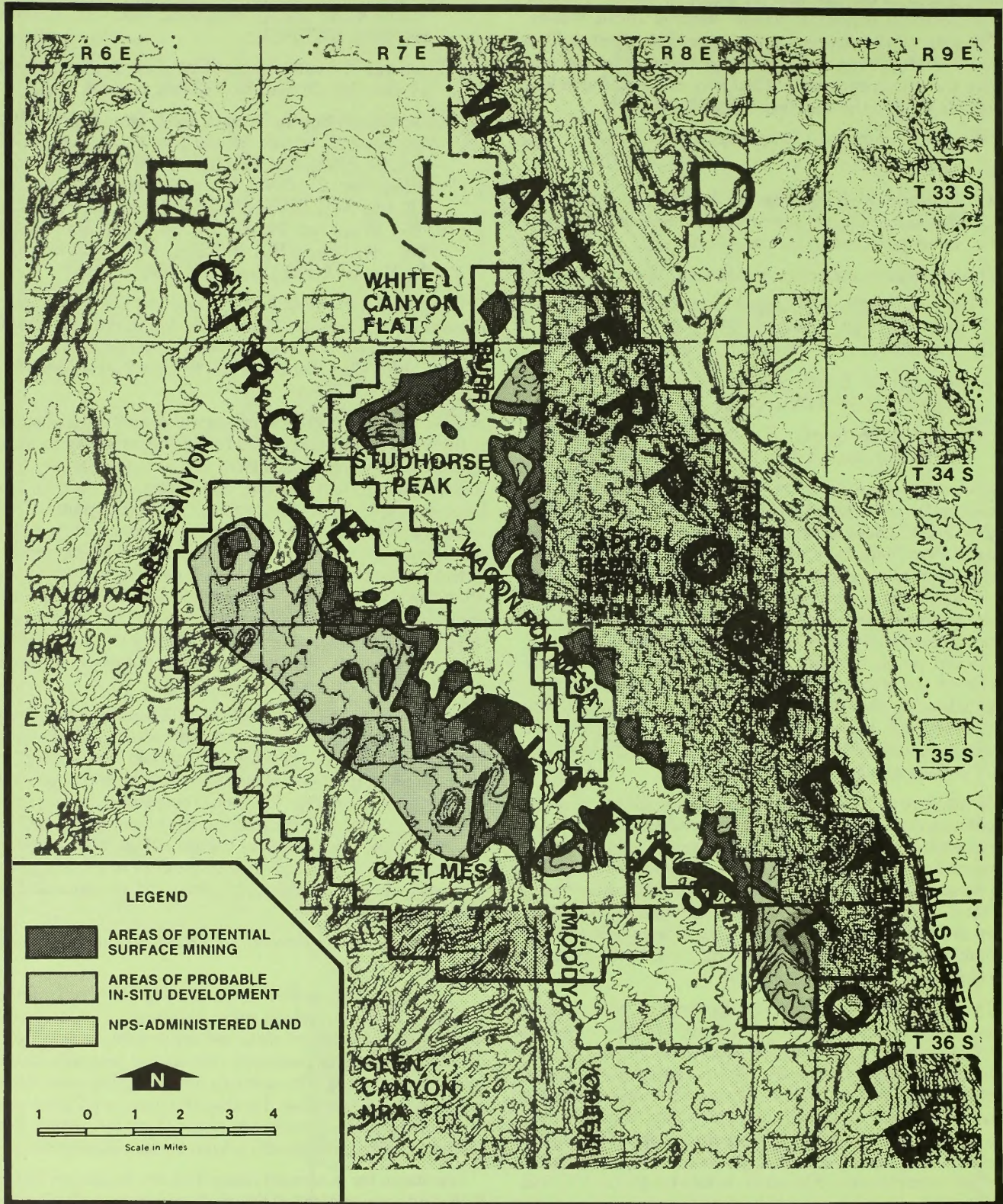


FIGURE 2-18
TAR SAND RESOURCES
CIRCLE CLIFFS STSA

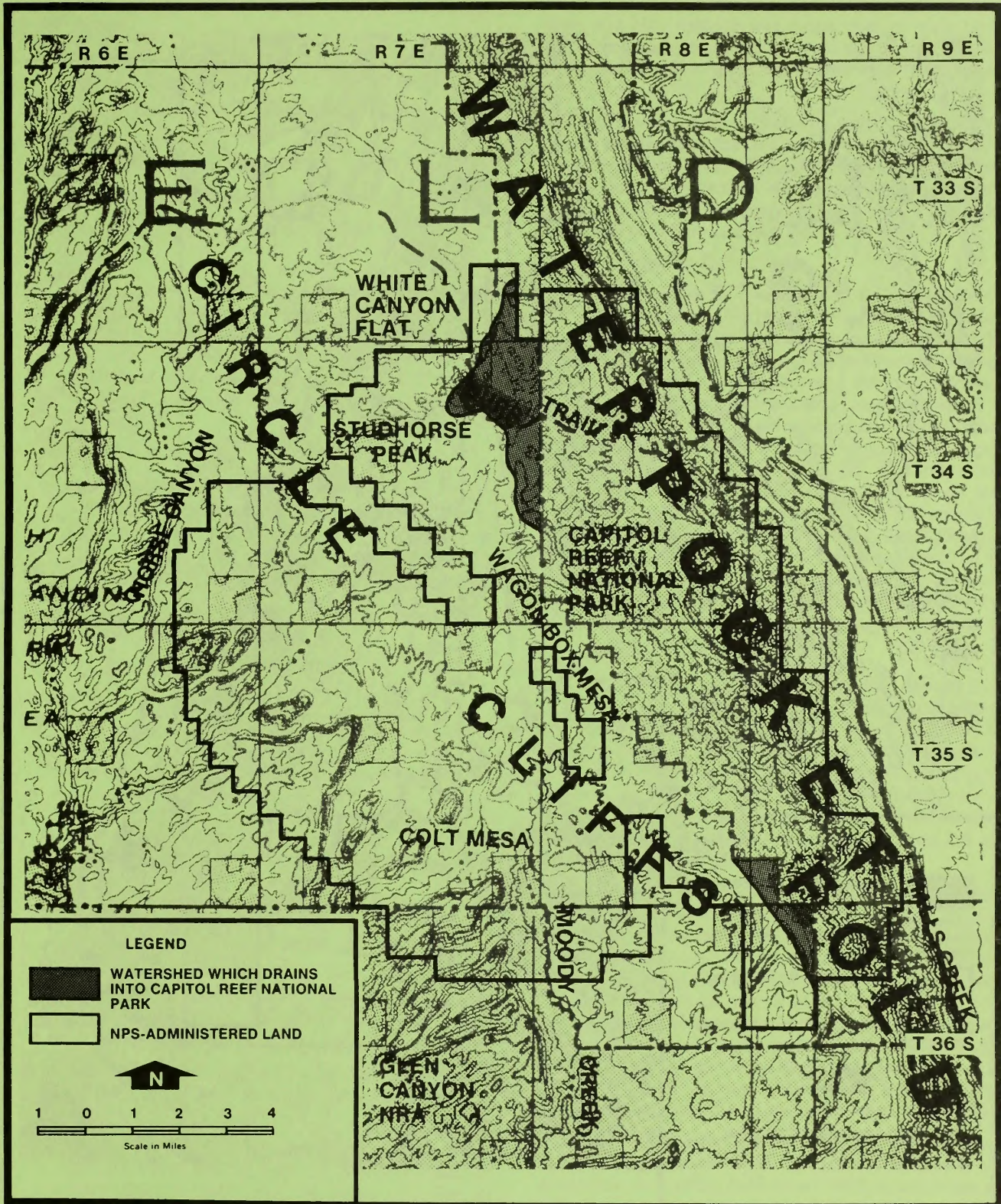


FIGURE 2-19
CAPITOL REEF NATIONAL PARK WATERSHED AREAS
CIRCLE CLIFFS STSA

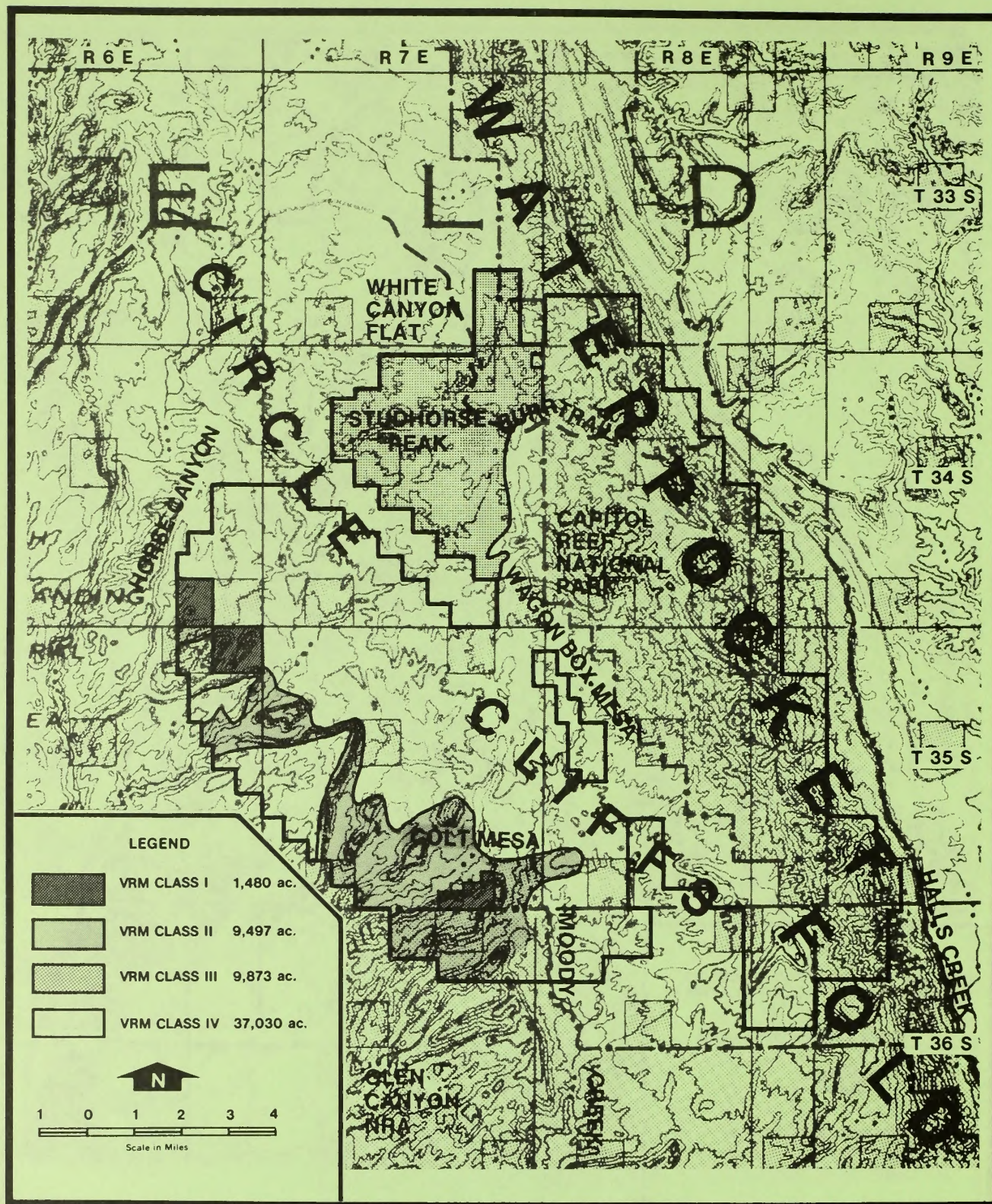


FIGURE 2-20
VRM CLASSES
CIRCLE CLIFFS STSA

CIRCLE CLIFFS STSA

Escalante Canyons Outstanding Natural Area (Category 3, 360 Acres).

Township 35 South, Range 7 East, Sec. 34, SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 35, SE $\frac{1}{4}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ S $\frac{1}{2}$, N $\frac{1}{2}$ SE $\frac{1}{4}$.

Wolverine Petrified Wood Natural Area (Category 3, 1,120 Acres).

Township 34 South, Range 6 East, Sec. 35, E $\frac{1}{2}$, E $\frac{1}{2}$ W $\frac{1}{2}$;

Township 35 South, Range 6 East, Sec. 1.

Sensitive Watershed (Category 2, 3,240 Acres).

Stipulation:

- Oil and gas resources on this lease may be extracted by conventional methods only; no in-situ or surface mining methods will be employed to extract tar sand deposits. Secondary recovery of liquid hydrocarbons and underground mining methods may be employed only upon approval by the authorized officer of BLM.

This stipulation applies to the following areas:

Township 34 South, Range 7 East, Sec. 1, all; Sec. 11, N $\frac{1}{2}$; Sec. 12., all; Sec. 13, E $\frac{1}{2}$, E $\frac{1}{2}$ W $\frac{1}{2}$; Sec. 24, E $\frac{1}{2}$, E $\frac{1}{2}$ W $\frac{1}{2}$;

Township 35 South, Range 8 East, Sec. 35, E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$;

Township 36 South, Range 8 East, Sec. 1, E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 12, NE $\frac{1}{4}$ NE $\frac{1}{4}$.

Circle Cliffs (Category 2, 11,240 Acres).

Stipulation:

- Oil and gas resources on this lease may be extracted by conventional methods only; no in-situ or surface mining methods will be employed to extract tar sand deposits. Secondary recovery of liquid hydrocarbons and underground mining methods may be employed only upon approval by the District Engineer with concurrence of the authorized officer of BLM.

This stipulation applies to the following areas:

Township 34 South, Range 7 East, Sec. 25, E $\frac{1}{2}$, NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$;

Township 35 South, Range 8 East, Sec. 30, SW $\frac{1}{4}$ SW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 31, N $\frac{1}{2}$ N $\frac{1}{2}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$.

Township 35 South, Range 6 East, Sec. 11, E $\frac{1}{2}$; Sec. 12, all; Sec. 13, all; Sec. 14, E $\frac{1}{2}$ NE $\frac{1}{4}$; Sec. 24, NE $\frac{1}{4}$;

Township 35 South, Range 7 East, Sec. 7, W $\frac{1}{2}$ NW $\frac{1}{4}$, S $\frac{1}{2}$; Sec. 17, all; Sec. 18, all; Sec. 19, all; Sec. 20, all; Sec. 21, SW $\frac{1}{4}$; Sec. 22, E $\frac{1}{2}$ SE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 23, SW $\frac{1}{4}$; Sec. 25, SW $\frac{1}{4}$; Sec. 26, NW $\frac{1}{4}$, S $\frac{1}{2}$; Sec. 27, E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$; Sec. 28, SE $\frac{1}{4}$ NE $\frac{1}{4}$, W $\frac{1}{2}$, SE $\frac{1}{4}$; Sec. 29, all; Sec. 30, NE $\frac{1}{4}$; Sec. 33, all; Sec. 34, N $\frac{1}{2}$, SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 35, N $\frac{1}{2}$ N $\frac{1}{2}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$.

AFFECTED ENVIRONMENT

Air Quality and Climate

The average annual precipitation in Escalante is 10 inches. Most precipitation occurs November through

March. There are about 135 frost-free days in Escalante from mid May through late September or early October. Summer temperatures range from highs in the 80's to lows in the mid 50's. Winter temperatures range from highs in the 40's to lows of 15° F.

The STSA is within a Class II air quality designation. The area is bordered on the east by Capitol Reef National Park, which has been designated Class I. Because there are no nearby emission sources associated with population centers or industry, existing pollutant concentrations are expected to be low and well within the NAAQS.

Geology and Topography

The Circle Cliffs STSA is located on the west and east flanks of the Circle Cliffs uplift. The uplift is a large double-plunging anticline on the west margin of the Colorado Plateau. Waterpocket Fold, the steep east flank, dips from 25° to nearly vertical eastward toward the Henry Mountains syncline. The west flank dips at an average of about 2° to 3° for more than 25 miles into the Kaiparowits Basin. Rocks of the Triassic Moenkopi and Chinle formations are exposed in the STSA (see Figure 2-18). The area is remote, and tar sand deposits occur generally in rough terrain. Vari-colored rocks exposed along steep cliffs and deeply entrenched plateaus characterize the area. Drainage is predominantly southwestward into the Escalante River, about 8 miles southwest of the west flank. Elevations range from about 7,000-7,300 feet on the mesa tops to about 5,700 feet in the canyon bottoms.

Minerals

TAR SAND: The Circle Cliffs tar sand deposit consists of two major portions, an east and west flank, which are considered separate deposits by Ritzma (1980). The STSA also includes the relatively small Muley Twist and White Canyon Flat deposits, which are also considered separate deposits by Ritzma (1980). The Muley Twist and White Canyon Flat deposits occur in the Triassic Shinarump formation and are estimated to contain 0.5 and 2.8 million barrels of oil, respectively.

The Moenkopi formation contains more than 99.8 percent of the tar sand resource in the Circle Cliffs STSA. According to Davidson (1967), the lower ledge-forming unit of the Moenkopi formation is the major oil-impregnated sandstone in the Circle Cliffs area. This unit is variably impregnated with oil over a wide area in the STSA and contains about 95 percent of the oil in the deposit (Ritzma, 1980). Thickness of oil-impregnated intervals ranges from a few feet on the fringes of the deposits to over 200 feet in the central portions. Appendix 2 provides a favorability and certainty rating for oil and gas occurrence for this STSA.

Ritzma (1980) estimates there are 860 million barrels of in-place oil on the east flank and 447 million barrels on the west flank. According to Ritzma (1980), much of the reservoir sandstone is fine-grained, clayey, and micaceous and would present formidable problems in mining and extraction. Ritzma (1980) also reported a sulfur content of 3.36 percent for one sample from the east flanks and a range of 2.37 to 4.19 percent for 5 samples from the west flanks.

All of the west flank deposits are on land managed by BLM. Only about 12 percent of the east flank deposits (approximately 100 million barrels) are on land managed by BLM and are located along the boundary between BLM and

Capitol Reef National Park. Deposits located within the Park are not subject to leasing.

The amounts of tar sand recoverable by surface or in-situ mining are difficult to predict. Surface mining depends on the ratio of overburden to pay material, which ranges from 0 to 5.8 at Circle Cliffs. At a ratio exceeding 1:1, strip mining is generally considered not economically feasible. The remaining tar sand could conceivably be developed by in-situ methods. However, from an economic and technical standpoint, in-situ development would probably be limited to the most favorable areas. This would include areas where deposits are sufficiently thick, perhaps 50 feet or more, and where limited access and rugged topography do not create economic and technical problems. Approximately 8,500 acres of potential surface mining and 18,800 acres of probable in-situ development were identified (see Figure 2-18). Based on data from Ritzma (1980), it is estimated that roughly 150 million barrels of oil and 400 million barrels of in-place oil would be available for surface and in-situ mining methods, respectively.

Appendix 2 includes a system for rating oil and gas potential. Although not developed for tar sand, this system does provide some idea of tar sand potential in an area. In areas of known surface and subsurface deposits, the highest rating of F4/C4 has been assigned. The remainder of the STSA is more difficult to rate. It is not known if minable deposits exist in the subsurface in the westernmost portion of the STSA. Based on these factors, a lower rating of F3/C2 is assigned to this area of the STSA. The area between the east and west flanks is generally devoid of minable deposits and is assigned an even lower rating of F2/C4.

OIL AND GAS: Exploration for oil and gas has been limited in the area because of rugged topography, hard rock formations, and loss of drill fluid. About 2,500 acres of BLM-administered land within the STSA are unleased for oil and gas. Limited drilling in Township 34 South, Range 7 East, Sec. 24 yielded good oil shows in the Permian Cedar Mesa sandstone along with saturation in the Moenkopi formation and Kaibab limestone. However, the oil was too thick for production through the wells.

Using the same rating system for oil and gas potential, a rating of F2/C2 was obtained for the STSA for any oil and gas occurrence other than tar sand. This is partially the result of major breaching of the anticline and exposure of the deposit, causing extensive weathering and degradation of the oil contained in the trap. Most of the volatiles have escaped, and as much as 50 percent of the heavier oil once in place may have been removed by erosion. However, the STSA is underlain by older pre-Mesozoic rocks which remain largely untested for oil and gas.

URANIUM: There are numerous uranium prospects and claims in the STSA. Uranium occurs chiefly in the Shinarump at the base of the Triassic Chinle formation where it rests on the Triassic Moenkopi formation. Significant channel deposits occur in Capitol Reef National Park in Township 35-36 South, Range 8 East, near Deer Point and at White Canyon Flat outside the Park boundary in an area of potential surface tar sand mining. Quantification of the uranium deposit is not possible because of lack of data.

Soils

Detailed soil mapping and interpretations are not available for the STSA. The soil information presented here is from *Soils of Utah* (U.S. Department of Agriculture [USDA], Soil Conservation Service and Utah State University, 1975), and from on-site familiarity. Thus, this information does not replace the need nor should it replace the use of detailed soil surveys or on-site investigations.

The dominating landscapes are highly dissected, rolling, steep hills and associated fans and floodplains. The soils are dominantly shallow to bedrock and well drained. Textures are loamy or loamy with gravel and cobble. Moderately deep and deep soils are most common on the less dominating fans and floodplains. Shallow soils and rock outcrops are most common on the dominating hills. Runoff is medium to rapid, and sediment yield and erosion hazard are moderate to high.

The next dominating landscapes are dissected rolling valleys and associated fans and floodplains. Soils are dominantly deep and well drained; textures are loamy or loamy with gravel and cobble. Shallow and moderately deep soils occur on the fans. Runoff is medium to rapid, and sediment yield is low to high. Erosion hazard is moderate to severe.

The next dominating landscapes are mesas, benches, and associated breaks and cliffs. Soils on the undulating and rolling areas are shallow to deep loamy or loamy with gravel and cobble. Runoff is low to medium, and sediment yield is low to moderate. Erosion hazard is slight to moderate. The steep to very steep breaks and cliffs are dominated by rock outcrop.

About 70 to 80 percent of the STSA has a moderate to severe erosion hazard and moderate to high sediment yield. Accelerated erosion is presently evident.

Vegetation

The major vegetation type found in the STSA is pinyon-juniper woodland. This type is characterized by Utah juniper and pinyon pine. Other species associated with this type but occurring in smaller amounts include galleta grass, blue grama, three-awn, Indian ricegrass, big sagebrush, broom snakeweed, Mormon tea, rabbitbrush, and fourwing saltbush. The big sage type occurs on deeper soil areas of the benches, with shadscale dominating the heavier, poorly drained soils. Species furnishing the bulk of vegetation for livestock grazing are galleta grass, Indian ricegrass, fourwing saltbush, Mormon tea, and shadscale. It takes an average of 22 acres to provide forage for one cow per month on suitable areas. Over 50 percent of the area is rated unsuitable for livestock grazing because of steep slopes or lack of forage.

There are no threatened, endangered, or sensitive plant species known to occur in the STSA.

Water Resources

The STSA is within two subbasins of the Colorado River basin. Most of the area is drained by the Escalante River system. The remaining small area is drained into Halls Creek, which runs south through Capitol Reef National Park (see Figure 2-19).

The area is characterized by pinyon-juniper-covered rolling hills and cliffs dissected by normally dry washes. Erodible soils, sparse vegetation, and intense summer thunder

CIRCLE CLIFFS STSA

storms combine to produce high sediment yields throughout most of the area.

Natural water sources are very sparse, with only 3 or 4 known springs or seeps. Most of the existing on-site water comes from the impounding of rain and snowfall into stock ponds, reservoirs, and erosion control structures. At present, surface water is used mainly for wildlife and stockwatering purposes.

GROUNDWATER. The Permian Kaibab limestone is the oldest formation. It is exposed near the axis of the Circle Cliffs anticline. The Kaibab limestone is several hundred feet thick and is made up of limestone, sandy limestone, and minor amounts of other rocks. Because of large cavities, any water in this formation is generally drained. The Kaibab is overlain by the Triassic Moenkopi formation. The Moenkopi formation is composed of reddish-brown claystone, siltstone, and sandstone that does not absorb, transmit, or yield water readily. The only prospective aquifers are alluvial deposits in drainage bottoms which are underlain by impermeable rocks. Wells generally would be less than 50 feet deep and would yield less than 1 gallon per minute. Water quality is unknown, although it is probably poor behind existing impoundments.

Wildlife

The STSA is inhabited by approximately 30 mammal species, 90 bird species, 16 reptile species, and two amphibian species. There are no fish in the STSA.

Approximately 45 to 55 deer inhabit the area from late fall to spring. Deer numbers are currently well below historical levels. According to UDWR, deer numbers are increasing and should continue to increase for the next several years. Desert bighorn sheep were transplanted into the Moody Canyon area in 1975-76 by UDWR. This herd presently has approximately 50 sheep. The herd has been expanding northward, and sheep now occupy about 1,080 acres in the extreme southeastern corner of the STSA.

Mourning dove is the only game bird in the STSA. This species is common during spring and summer. Several raptor species have been reported within the STSA, but no nests have been documented. Two golden eagle nests have been located within 2 miles of the STSA.

THREATENED AND ENDANGERED SPECIES:

Two endangered species occur within the STSA. The peregrine falcon is probably a permanent resident. An active aerie is located approximately 6 miles east of the STSA, and suitable nesting habitat occurs within the STSA. The bald eagle is probably a rare winter visitor of the STSA.

Livestock and Agriculture

The public lands of the STSA include the grazing allotments summarized in Table 2-10. One corral, two spring developments, several reservoirs, and about 4 miles of fence are located in the STSA and are used to facilitate livestock management. There is no agricultural development within the STSA.

Visual Resources

The STSA falls within the following VRM Classes: I, (1,480 acres); II (9,497 acres); III (9,873 acres); and IV (37,030 acres) (see Figure 2-20).

Visual scenery within the STSA is dominated by the massive Navajo sandstone and Wingate formations of the

Cliffs (VRM Class II). The majority of the STSA lies in the basin between Circle Cliffs and Waterpocket Fold. The Basin (Class IV) is intermittently broken with numerous pinyon-juniper-covered mesas (Colt and Stud Horse Peaks and Wagon Box Mesa), which add variety (B scenic quality). On the east flank of the STSA is the moderately sloping Waterpocket Fold, periodically broken by east-west trending drainages. The eastern slopes of the Fold form a major visual feature within Capitol Reef National Park.

Burr Trail is the major travel corridor within the STSA. It currently receives an estimated 5,000 visits per year and supplies a major vehicle link to the southern portion of Capitol Reef National Park.

Recreation

Recreation resources within the STSA are shown on Figure 2-17. There are no formally developed recreation facilities within the STSA. There is one formally designated outstanding natural area, Escalante Canyons. BLM has also identified Wolverine Petrified Wood Natural Area as outstanding. This natural area was withdrawn from mineral entry and placed in category 3, no surface occupancy, to protect and preserve the natural and scientific values during the preparation of the MFP in 1981.

Approximately 20,280 acres of the STSA coincide with the Canyons of the Escalante CMA. In 1982 this cooperative agreement to manage for recreation values was promulgated between BLM and Glen Canyon National Recreation Area (NRA). Formal planning for recreation has not been completed.

Recreation Opportunity Spectrum (ROS) (BLM Manual 8321) values have been identified: 5,561 acres of the STSA contain primitive ROS values and 54,799 acres contain semi-primitive motorized values (Glen Canyon NRA acreage included). The primitive ROS values lie largely above and west of Circle Cliffs, with semi-primitive motorized values scattered throughout the remainder of the STSA.

A complete description of ROS values is found in BLM Manual 8321. These values are derived from the physical, social, and managerial settings required to enable a visitor to obtain a satisfying recreation experience. A brief description of the primitive and semi-primitive motorized recreation is included in the Glossary.

Recreation use within the STSA is limited in nature. Rockhounding, day hiking, backpacking, ORV touring, and photography are the major activities pursued. Several commercial and non-commercial survival groups use the STSA for backcountry survival encounters. Estimated use by survival groups within the STSA is 2,500 visitor days per year. The proposed 20-unit primitive campground at Burr Trail would be located directly adjacent to potential impacts of in-situ development.

Cultural Resources

Existing data relevant to the archaeological resources of the STSA and most of the immediately surrounding area are very limited. The area is so remote and limited in external and internal access that there has not been much archaeological work or sites recorded. Lack of data for this analysis, then, reflects a lack of on-the-ground inventory and not necessarily a lack of resource. The area could be quite rich archaeologically and needs an inventory to

CHAP 2: ALTERNATIVE EVALUATIONS

TABLE 2-10

Livestock Grazing Data for the Circle Cliffs STSA

Allotment Name	No. of Operators	Kind of Livestock	No. of AUMs ^a Preference (Active)	Season of Use	Percent of Allotment Within STSA
Big Bowns	2	Cattle	1,500	10/16 - 3/31	15
Circle Cliffs	3	Cattle	1,451	11/1 - 3/31	STSA portion unsuitable for livestock grazing
Death Hollow	2	Cattle	1,005	11/1 - 3/31	87
Moody	2	Cattle	1,600	11/1 - 3/31	15
Steep Creek	2	"	446	11/16 - 1/15 5/16 - 6/15	5
Wagon Box	3	"	605	11/1 - 4/15	91

^aTotal allowable use.

improve the base for assessment.

According to existing records, only six recorded archaeological sites appear within the STSA (42 Ga 86, 87, 662, 663, 1636, 1637). All six are small lithic scatters with no evidence of depth; these sites did not yield diagnostics. Known and recorded site concentrations near the STSA showed a highly varied pattern of site densities and may or may not be relevant to the area under consideration.

Wilderness

A large portion of the STSA (approximately 10,260 acres) west of Horse Canyon Road is subject to BLM's Wilderness IMP. Phipps Death Hollow, Gulch, and North Escalante Canyon ISAs lie partially within the STSA (see Figure 2-17). Impacts to wilderness values would be limited.

Land Uses and Land Use Plans

Uses within the STSA include livestock grazing, hunting, rock collecting, backpacking, hiking, and mineral activities. (Refer to each resource heading for an analysis of impacts to these activities.) The current MFP provides protection for the Wolverine Petrified Wood Natural Area and the Escalante Canyons Outstanding Area. Capitol Reef National Park also has a management plan. There are no rights-of-way or non-mineral leases within the STSA on Federal land.

Socioeconomics

The communities of Boulder and Escalante are located a short distance west of the STSA. The following discussion will, therefore, concentrate on the eastern portions of Garfield County and especially the communities of Boulder and Escalante.

Populations for these communities for the years 1960, 1970, and 1980 are presented below (U.S. Department of Commerce [USDC], Bureau of the Census, 1981).

Community	1960	1970	1980
Boulder	108	93	113
Escalante	702	638	652

The economic and social structures of these communities were historically based on agriculture, and this industry remains a stabilizing force. Employment in the Boulder and Escalante area, however, is dominated by the sawmill industry, public schools, and Federal government. Accurate estimates of employment by industry are not available at the community level because of data limitations and non-disclosure restrictions. Total employment in the Boulder and Escalante area is approximately 276 workers, with an additional 70 to 80 workers commuting from the area (Utah Office of the State Planning Coordinator, 1982).

Employment data by industry are available for all of Garfield County. Table 2-11 presents employment estimates prepared by the USDC (1982a). The oil and gas industry is present; however, specific employment data for this industry are not available. Employment in Garfield County is dominated by government and government enterprises (20 percent of total employment), construction (18 percent), proprietorship (16 percent), services (13 percent), manufacturing (12 percent), and mining (10 percent). Employment levels in the construction, manufacturing, and mining industries have fluctuated widely in recent years. Income figures for Boulder and Escalante specifically are not available. However, personal income and earnings by industrial

source for Garfield County are presented in Table 2-12.

ENVIRONMENTAL CONSEQUENCES

Tar Sand Resources

An estimated 447 million barrels of oil are in place in the west flank deposit, and a smaller amount (approximately 100 million barrels) is in place on BLM-managed lands along the boundary of Capitol Reef National Park and at the White Canyon Flat deposits. About 25 percent of the west flank deposits and about 30 percent of the east flank deposits could be surface mined. The remainder of the deposits would be mined by in-situ methods. It is unknown how much of the resource would be irretrievably lost by surface-mining methods. In-situ methods, which account for about 75 percent of the tar sand deposits, typically recover 10 to 20 percent of the oil.

ALTERNATIVE 1, NO ACTION/EXISTING OIL AND GAS CATEGORIES: This alternative would allow all but the 1,120 acres identified as the Wolverine Petrified Wood Natural Area to be open under category 1 for tar sand leasing and conversion. The Wolverine Petrified Wood Natural Area is situated on the west fringe of the west flank deposit, and its potential for tar sand is less than that for the overall deposit. The tar sand resource impacted here probably involves less than 1 percent (about 4.5 million barrels of oil) of the resource in the west flank.

Environmental constraints would still be placed on tar sand development even in category 1 areas. By regulation, a plan of operation must be provided prior to lease conversion and/or surface disturbance. Conditions of approval of such plans come only after an EA or EIS is completed. It is possible that stipulations and mitigating measures would be required to protect sensitive areas. Such stipulations could have some small impact on tar sand development.

ALTERNATIVE 2, MAXIMUM DEVELOPMENT: This alternative would place all of the STSA under category 1 for oil and gas and tar sand development. With the exception that development of these resources would be allowed in the Wolverine Petrified Wood Natural Area, this alternative would have the same effect as Alternative 1.

ALTERNATIVE 3, MULTIPLE USE (PREFERRED ALTERNATIVE): This alternative would place approximately 34,800 acres (69 percent of the BLM-managed portion) of the STSA in category 1. A total of 14,480 acres would be placed in category 2, allowing only oil and gas and in-situ development of tar sand. Approximately 1,300 acres (15 percent of the potential surface mining area) would not be available for surface development. Roughly 5 percent (about 20 million barrels) of the in-place oil would be lost to surface development.

A total of 1,480 acres would be placed in category 3, closed to occupancy. Because these areas are small, oil and gas development could be realized through directional drilling methods. However, the no surface occupancy stipulation would place more severe restrictions on tar sand development. Category 3 areas occur in those portions of the STSA where in-situ extraction is the likely development method. While the no-surface occupancy stipulation might not theoretically prohibit in-situ development, for all practical purposes, it would make any development unlikely. Less than 2 million barrels of oil would be lost to development as a result of these stipulations.

TABLE 2-11

Employment Data for Garfield County in 1980
(Full and Part Time)^a

Employment By Place of Work	Number
Total Employment ^b	2,143
Number of Proprietors	349
Farm Proprietors	209
Non-farm Proprietors	140
Total Wage and Salary Employment	1,794
Farm	27
Non-farm	1,767
Private	1,332
Mining	208
Construction	379
Manufacturing	247
Non-durable Goods	(D)
Durable Goods	(D)
Transportation and Public Utilities	84
Wholesale Trade	(L)
Retail Trade	126
Finance, Insurance, and Real Estate Services	16
Government and Government Enterprises	270
Federal, Civilian	435
Federal, Military	140
State and Local	24
	271

Source: USDC, 1982.

^aEstimates based on Standard Industrial Code (72).

^bConsists of wage and salary jobs plus number of proprietors.

(D) Not shown to avoid disclosure of confidential data.
Data are included in totals.

(L) Less than ten wage and salary jobs.

TABLE 2-12

Personal Income and Earnings Data
for Garfield County in 1980

Source of Income	Earnings (in \$1,000)
Total Labor and Proprietors' Income by Place of Work (Earnings)	24,792
By Type	
Wage and salary disbursements	20,085
Other labor income	2,070
Proprietors' Income	2,637
Farm	807
Non-farm	1,830
By Industry Source	
Farm	949
Non-farm	23,843
Private	19,049
Agricultural services and other	79
Mining	4,222
Construction	5,536
Manufacturing	3,294
Non-durable goods	a
Durable goods	a
Transportation and public utilities	1,545
Wholesale trade	96
Retail trade	1,302
Finance, insurance, and real estate	189
Services	2,786
Government	4,794
Federal, civilian	1,656
Federal, military	64
State and local	3,074
Derivation of Personal Income by Place of Residence	
Total labor and proprietors' income by place of work (earnings)	24,792
Less: Personal contributions for social insurance by place of work	1,486
Net labor and proprietors' income by place of work	23,306
Plus: Residence adjustment	-5,129
Net labor and proprietors' income by place of residence	18,177
Plus: Dividends, interest, and rent	3,399
Plus: Transfer payment	4,188
Personal Income by Place of Residence	25,764
Per Capita Personal Income (dollars)	6,997

Source: USDC, 1982a.

^aNot shown to avoid disclosure of confidential information. Data included in totals.

ALTERNATIVE 4, RESTRICTED DEVELOPMENT (RESOURCE PROTECTION): This alternative would place 34,800 acres (69 percent of the STSA under BLM management) under category 1. A total of 14,480 acres would be placed in category 2, allowing only oil and gas exploration and development. No surface mining or in-situ development methods would be allowed for tar sand. The stipulation to limit tar sand development would be extended to include in-situ development. Approximately 3,400 acres (18 percent of the probable in-situ area) would be unavailable for development. Roughly, 16 percent (about 70 million barrels) of the in-place oil would be affected. Based on a 10-20 percent recovery for in-situ development, about 7-14 million barrels of oil would be foregone from recovery. The 1,480 acres closed to surface occupancy in Alternative 3 would also be closed to surface occupancy.

Other Mineral Resources

The effect of tar sand extraction on other mineral values would vary. Potential oil and gas deposits would not be affected by in-situ or surface-mining methods, since any oil and gas resources would occur at considerable depth beneath tar sand deposits.

Potential uranium deposits located in surface minable areas could be destroyed by surface mining. The White Flat Canyon deposit near the STSA boundary appears to be the only area where this would be a major concern. Here any potential uranium would occur in the Shinarump member, which contains about 2.8 million barrels of oil in the form of tar sand. In the remaining area of potential surface mining, the Shinarump has been largely removed by erosion. Outcrops of Shinarump occur throughout the area of probable in-situ mining. It is expected that in-situ methods would have little impact on surface exposures of Shinarump and any related uranium resources.

ALTERNATIVES 1, 2, 3, and 4: Uranium deposits in the White Canyon Flat Area could be destroyed.

Other Resource Values

AIR QUALITY: Many of the problems associated with coal surface mining (i.e., wind-blown particulates) would be common to tar sand surface mining. Additionally, all surface processing (hot water, solvent, and surface retorting) would require the introduction of heat. These boilers or furnaces would probably be fired by residual oil or coal and would result in emissions of SO₂, NO, NO₂, and particulate matter. Removal of any ash, coke, waste water, or other materials would require adequate controls.

In-situ technologies could also pose serious air quality problems. Both the steam-drive and fire-flooding processes burn coal or the produced crude to operate engines to drive the steam generators or air compressors. The combustion process results in the production of SO₂ and particulate matter and the formation of NO and NO₂.

Installation of costly control devices might have to be stipulated to meet Class I air quality standards at Capitol Reef National Park. The cost could affect the economies of tar sand recovery in such areas. Air quality impacts for the Circle Cliffs STSA are discussed in detail in Volume I of this EIS.

Alternative 1, No Action, Existing Oil and Gas Categories: While only 27,300 acres (54 percent of the STSA) are thought to contain tar sand, all of the above-mentioned

impacts could occur on 98 percent of the STSA. Impacts could occur on the area of potential surface mining (approximately 8,500 acres). Impacts could occur from in-situ development on approximately 18,800 acres.

Alternative 2, Maximum Development: All of the impacts described above could occur throughout the STSA. Only 1,120 acres (Wolverine Petrified Wood Natural Area) would be additional to the impacts of Alternative 1.

Alternative 3, Multiple Use (Preferred Alternative): Impacts to air quality would be reduced by elimination of surface mining on the 14,480 acres closed to surface mining to protect scenic and watershed values. This would include about 1,300 acres of the potential surface minable area. No surface occupancy would be allowed on 1,480 acres (Wolverine Petrified Wood and Escalante Canyons Outstanding Natural Areas).

Alternative 4, Restricted Development (Resource Protection): This alternative would eliminate impacts to air quality from in-situ mining on the 14,480 acres closed to surface mining under Alternative 3. In addition to the 1,300 acres of potential surface minable area affected, approximately 3,400 acres of probable in-situ development would be affected.

GEOLOGY AND TOPOGRAPHY: Surface mining would irreparably alter existing topographic features. The extent of alteration could cover about 8,500 acres under full tar sand development. Characteristic features would be altered as mesas and canyons were lost by overburden removal or filling by waste disposal. Reclaiming to original contours or blending reclaimed areas with adjacent undisturbed areas would be highly unlikely. In-situ mining would not result in these major impacts; however, a few feet of subsidence could occur. About 18,800 acres are considered favorable for in-situ development.

Alternative 1, No Action/Existing Oil and Gas Categories: All of the above-mentioned impacts could occur. The entire STSA would be available to tar sand development with only one exception: the Wolverine Petrified Wood Natural Area would be closed to surface occupancy.

Alternative 2, Maximum Development: Impacts would be the same as Alternative 1 except that development would also be allowed in the Wolverine Petrified Wood Natural Area.

Alternative 3, Multiple Use (Preferred Alternative): Approximately 14,480 acres would be closed to surface mining to protect watershed and scenic values. The Wolverine Petrified Wood Natural Area and the Escalante Canyons Outstanding Natural Area (1,480 acres) would be closed to surface occupancy. All other areas (about 34,800 acres) would be placed in category 1 and would be subject to the impacts described above.

Alternative 4, Restricted Development (Resource Protection): Impacts would be similar to those occurring under Alternative 3 except in-situ development would not be allowed in the 14,480 acres under category 2 protection (see Figure 2-16).

SOILS: There would be removal and respreading of the surface soil as a result of surface mining. In many areas, the ratio of soil to rock would be so low that there would not be sufficient soil for revegetation. In-situ development would require an unknown amount of temporary alteration of the

top soils wherever roads, drill pads, building sites, and waste dumps were situated. It is estimated that, during the total period of in-situ mining, about 40 percent of the soil surface would be disturbed. Erosion would increase from development activities. Generally, soils of sufficient depth and low water-holding capacity, slope, and rainfall severely restrict reclamation.

Alternative 1, No Action/Existing Oil and Gas Categories: All of the above-mentioned impacts could occur in the STSA with the exception of the Wolverine Petrified Wood Natural Area. Soils on approximately 8,500 acres of potential surface minable area and 18,800 acres of probable in-situ mining area could be impacted.

Alternative 2, Maximum Development: All of the above-mentioned impacts could occur in the STSA, including the Wolverine Petrified Wood Natural Area. However, since only a minor amount of the natural area is considered as probable for in-situ mining development, there would probably be little difference in the impacts resulting from Alternative 1.

Alternative 3, Multiple Use (Preferred Alternative): Impacts from surface mining would be eliminated on the 14,480-acre area protected under category 2 (no surface mining) for watershed and scenic values. About 1,300 acres of the category 2 area would have potential for surface mining. All impacts resulting from tar sand development would be eliminated in the Wolverine Petrified Wood Natural Area and the Escalante Canyons Outstanding Natural Area, which would be closed to surface occupancy. Soils on approximately 7,200 acres of potential surface minable area and 18,800 acres of probable in-situ mining area would be impacted.

Alternative 4, Restricted Development (Resource Protection): Impacts would be similar to those described under Alternative 3, with the exception that the 14,480-acre area protected from surface mining impacts would also be protected from in-situ impacts. Of the 14,480 acres protected, 1,300 acres have potential for surface mining and about 3,400 acres have potential for in-situ development. Therefore, less erosion would occur under this alternative. Soils on potentially surface mineable area (approximately 7,200 acres) and probable in-situ mining areas (15,400 acres) would be impacted.

VEGETATION: Surface mining would pose the greatest threat to vegetation through large area disturbance and loss of topsoil. Revegetation after loss of topsoil is a slow and difficult task, especially in areas of low rainfall. Average annual precipitation for the area is 9 to 11 inches. Revegetation using introduced and native species could be expected on areas of deeper soil where adequate topsoil was saved. Success could be expected within about 5 years of planting. However, poorer soil areas and areas where topsoil was lost would require a much longer time to achieve revegetation, and efforts might not be successful.

In-situ development methods would reduce the total acreage of vegetation disturbed. An in-situ development field would probably disturb at least 40 percent of the land area within the field as compared to 100 percent with surface mining. Roads and pads would be the change agents (Weber, 1983). Revegetation of an in-situ development field would be easier and quicker than with surface mining because more topsoil is normally saved and the ratio of the

area disturbed is less in proportion to total size.

Alternative 1, No Action/Existing Oil and Gas Categories: All of the above-mentioned impacts could occur throughout the STSA, with the exception of the Wolverine Petrified Wood Natural Area. Impacts from surface mining could occur on approximately 8,500 acres of the STSA having potential for surface mining. However, in-situ mining would probably be limited to the approximately 18,800 acres considered most favorable for development; vegetation would, therefore, be disturbed on 7,520 acres.

Alternative 2, Maximum Development: The entire STSA would be open to tar sand development under category 1. Impacts resulting from tar sand development would be the same as those described for Alternative 1.

Alternative 3, Multiple Use (Preferred Alternative): Impacts from surface mining would be eliminated within the 14,480 acres protected under category 2 for scenic and watershed values. Within this area an estimated 1,300 acres have a potential for surface-mining activities. No impacts would occur on the 1,480 acres (Wolverine Petrified Wood Natural Area and Escalante Canyons Outstanding Natural Area) closed to surface occupancy. Consequently, 7,200 acres could be surface mined and vegetation would be destroyed. Impacts resulting from in-situ development could occur throughout the remainder of the STSA. The greatest potential for these impacts would be on the 18,800 acres identified as having the highest potential for in-situ development. Vegetation on 7,520 acres would be destroyed.

Alternative 4, Restricted Development (Resource Protection): The 14,480 acres closed to surface mining in Alternative 3 would be further protected by also prohibiting in-situ mining. This would eliminate impacts resulting from tar sand development within these areas having scenic and watershed values. No impacts would occur in the 1,480 acres (Wolverine Petrified Wood Natural Area and Escalante Canyons Outstanding Natural Area) closed to surface occupancy. Consequently, 7,200 acres could be surface mined and vegetation could be destroyed. Impacts resulting from in-situ development could occur throughout the remainder of the STSA. The greatest potential for these impacts would be in the 18,800 acres identified as having the highest potential for in-situ development. Vegetation on 6,160 acres would be destroyed.

WATER RESOURCES: Impacts to water and watershed resources from surface mining are similar to those from coal-strip mining. Removal of vegetation and soil would change drainage patterns and increase sediment production. Because of the highly erodible nature of the Moenkopi-derived soils and rugged topography, mitigation would not be totally effective in controlling sediment yields to Halls Creek and Escalante River.

Surface mining probably would not impact any deep groundwater aquifer. The major impact would occur to the small, shallow, alluvial aquifers that occur in drainage bottoms. These aquifers would probably be lost because of tar sand and overburden removal.

Water quality would deteriorate from the existing condition mainly because of increased sediment loads. Degradation would be related to the success of reclamation and surface flow control techniques. Water requirements for a surface mine are presently unknown because the size and nature of the mining operation are also unknown. Since

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unallocated water is not available, purchase of water rights for development would be necessary.

Impacts to watershed and soil from in-situ mining would not be as severe as for strip mining. In-situ impacts would occur from road, drill pad, pipeline clearing, and facility construction. These types of impacts usually result in increased erosion and higher sediment yields during storm events. It is possible that, through proper construction methods, mitigating measures, and compliance with surface-disturbance stipulations, these impacts would be lessened.

In-situ mining could impact existing aquifers. Injection of solvents and steam or burning would affect groundwater quality in the tar sand zone. The flow of the aquifer, especially the shallow perched tables of the valley bottoms, could be changed. After the oil source was removed, the ground could subside, possibly resulting in fracturing of geologic structures. This could change spring or seep flows and dry up any aquifers.

Alternative 1, No Action/Existing Oil and Gas Categories: All of the above-mentioned impacts could occur. Approximately 8,500 acres could be impacted by surface mining. The remainder of the STSA could be impacted by in-situ methods. Impacts would likely be limited to the 18,800 acres considered favorable for in-situ development. Areas draining into Capitol Reef National Park would be affected by increased sediment yields and flood damage by both in-situ mining on 610 acres and by surface mining on 675 acres. No impacts would occur on the 1,120-acre Wolverine Petrified Wood Natural Area since it would be closed to surface occupancy.

Alternative 2, Maximum Development: This alternative would allow maximum disturbance of the surface and subsurface estates within the STSA. Impacts would be the same as those under Alternative 1 except that the Wolverine Petrified Wood Natural Area would be open to tar sand development.

Alternative 3, Multiple Use (Preferred Alternative): Impacts from surface mining would be eliminated on about 14,480 acres protected for scenic and watershed values. Only about 1,300 acres of the 14,480 acres are considered as having high potential for surface mining. No surface mining would be allowed on the areas that drain into Capitol Reef National Park. The Wolverine Petrified Wood Natural Area and the Escalante Canyons Outstanding Natural Area would be closed to surface occupancy.

Alternative 4, Restricted Development (Resource Protection): Impacts would be similar to those under Alternative 3 except that the 14,480-acre area protected from surface mining impacts listed in Alternative 3 would also be protected from impacts resulting from in-situ development.

WILDLIFE: Impacts to wildlife would occur primarily from direct loss of habitat from mining, roads, and other construction, and from secondary impacts resulting from increased human access and disturbance. There would be a maximum loss of less than 10 percent of the total available deer winter range within the STSA. However, impacts to deer would be minimal because the STSA comprises only 1 percent of the deer winter range. It is likely that most of these deer would be able to find other suitable habitat within or adjacent to the STSA. Harassment to bighorn sheep would increase because of increased human population.

Sheep would avoid all disturbed sites. Displaced sheep would likely move into Capitol Reef National Park or back to Moody Canyon. There would be a loss of habitat for mourning doves, raptors, and nongame species, although there should be no significant impacts on populations.

Threatened and Endangered Species: Potential peregrine falcon nesting habitat could be affected. Consultation with FWS would be initiated to determine impacts to any threatened and endangered species prior to tar sand development.

Alternative 1, No Action/Existing Oil and Gas Categories: All of the above-mentioned impacts could occur, with the exception of the Wolverine Petrified Wood Natural Area, which would be closed to surface occupancy.

Alternative 2, Maximum Development: All of the above-mentioned impacts could occur.

Alternative 3, Multiple Use (Preferred Alternative): Impacts from surface mining would be eliminated within a 14,480-acre area protected for scenic and watershed values. Only about 1,300 acres of this area are considered to have any real potential for surface mining. All impacts would be eliminated in the Wolverine Petrified Wood Natural Area and the Escalante Canyons Outstanding Natural Area because these areas would be closed to surface occupancy.

Alternative 4, Restricted Development (Resource Protection): Impacts would be the same as those under Alternative 3, except in-situ mining impacts would also be eliminated in the 14,480 acres protected for scenic and watershed values. It appears that about 3,400 acres of probable in-situ mining area would be affected.

LIVESTOCK AND AGRICULTURE: Removal of vegetation for tar sand development would reduce the amount of forage available for livestock grazing. Either type of tar sand development would reduce the amount of livestock forage available for an extended period until successful revegetation had been completed. In-situ methods would reduce considerably the impact on livestock grazing and the interruption of livestock operations. It is possible that rehabilitation could never be successful on lands which were surface mined. Livestock operators could lose use of one corral, two spring developments, several reservoirs, and about 4 miles of fence located within the STSA. Changes in management and livestock distribution in these allotments would result.

Alternative 1, No Action/Existing Oil and Gas Categories: The above-mentioned impacts could occur with tar sand development. The only exception would be on the Wolverine Petrified Wood Natural Area, which consists of less than two sections in the Death Hollow Allotment.

Alternative 2, Maximum Development: The entire STSA would be open for development. All impacts affecting livestock could occur.

Alternative 3, Multiple Use (Preferred Alternative): The impacts mentioned above could occur in the category 1 area (69 percent of the STSA). Two percent of the area would be in category 3, no surface mining, and no impact would occur to grazing. The remaining 29 percent (category 2) would allow only oil and gas leases and in-situ development of tar sand. This would reduce the impacts to grazing on Steep Creek and Big Bowns allotments since these fall entirely within this category. About 25 percent of the

CIRCLE CLIFFS STSA

Wagon Box Allotment is also in category 2. This alternative would have minor effects on the Circle Cliffs, Death Hollow, and Moody allotments, since most of the affected area would be in category 1.

Alternative 4, Restricted Development (Resource Protection): This alternative would offer the most protection for livestock grazing. The percent of allotments in each category would remain the same, but category 2 would allow no surface occupancy or in-situ tar sand development, only oil and gas leases. This alternative would minimize surface disturbance and impacts on vegetation and livestock grazing.

VISUAL RESOURCES: Impacts would be dependent on the methods of extraction employed. It is anticipated that surface mining would cause significantly more visual contrast than either in-situ or conventional oil and gas development. All visual classes in the STSA would be exceeded (impaired) during surface-mining and in-situ activities. The large scale of activities and nature of surface mining would significantly change the basic visual elements of line, form, color, and texture.

The visual resources of the STSA would be most impacted in the northeast (near Burr Trail) and in the southwest (Silver Falls/Moody Creek) in VRM Class I and II areas. These lands are located in the foreground/middle-ground distance zones of the Burr Trail and Horse Canyon roads. It is anticipated that 6,000 people could see development in these areas per year. The remaining portion of the surface mineable and in-situ areas lie in VRM Classes III and IV. While development of tar sand would exceed allowable visual disturbance during active development, it is anticipated that, with successful reclamation, VRM Class III could be attained under the strip-mining development scenario within 20 years. It is also anticipated that VRM Class II would be attained under an in-situ development scenario within 10 years of successful reclamation. Different time frames are required for reclamation for these two methods because of the magnitude of change associated with each scenario.

The potential for reclamation on fragile Moenkopi-derived soils is speculative at this time. Because no data are available on reclamation potential of surface or in-situ operations for the area, it is difficult to predict the success of reclamation measures. However, it is anticipated that extensive and potentially expensive reclamation procedures would be required.

The major visual contrasts introduced into the characteristic landscape by surface mining for tar sand would be similar in magnitude to surface coal mining. Removal of vegetation; destruction of delicate features providing protection against erosion; major road construction, excavation and stockpiling of overburden; stockpiling of tar sand; construction of boilers or furnaces, maintenance facilities, shops, residences, storage facilities and tanks; and water and waste disposal areas all would add significant visual contrast to a currently undeveloped landscape. It is assumed that, for purposes of this analysis, impacts from in-situ mining would be similar to an enhanced oil and gas development field. The visual contrast would result in less impacts than surface mining but would include significant road construction, drilling pads, structures and spoil areas; and placement of generators or compressors, treaters, storage tanks, and pipelines. Development would be less

labor intensive than surface mining; therefore, impacts resulting from residences would be far less after initial development. While excavation of parent material would be less, the introduction of structures into an otherwise undeveloped landscape would offer the greatest degree of impact. Upon removal of structures and rehabilitation of roads and drill pads, VRM Class II goals would be reached. It is expected that these impacts could continue for more than 20 years, when considering the time necessary for development and rehabilitation.

Alternative 1, No Action/Existing Oil and Gas Categories: The impacts described above would occur on all existing oil and gas category 1 areas. However, the 1,120-acre Wolverine Petrified Wood Natural Area would not be affected because of the application of the no surface occupancy stipulation (category 3). Potentially, contrast ratings on 360 acres of class I areas, 9,497 acres of Class II areas, 9,873 acres of Class III areas, and 37,030 acres of Class IV areas would be exceeded for an estimated development period of 10 to 30 years and a rehabilitation period of 10 or 20 years. It is anticipated that VRM Class I and II goals would be foregone permanently under a surface-mining scenario.

Alternative 2, Maximum Development: Impacts would be similar to Alternative 1, except for potential impairment of an additional 1,120 acres of Class I visual resources within the Wolverine Petrified Wood Natural Area.

Alternative 3, Multiple Use (Preferred Alternative): Potentially, contrast ratings on all lands within VRM Class I (1,480 acres) would be exceeded during active development and reclamation periods; certain VRM Class II and III lands would be protected from surface mining, but subject to impacts associated with in-situ operations on 14,480 acres within category 2. VRM Class II management goals could be attained within 10 years after successful reclamation. VRM Class I values would be protected on 1,480 acres within category 3. All lands in category 2 would be subject to impacts associated with traditional oil and gas development.

Alternative 4, Restricted Development (Resource Protection): Potentially, contrast ratings on all lands within VRM Class I (1,480 acres) would not be exceeded. VRM Class II and certain VRM Class III lands would be exempt from impacts associated with in-situ and surface-mining activities. All lands within categories 1 and 2 would be subject to impacts associated with traditional oil and gas development, but would be subject to a no surface occupancy stipulation on 1,480 acres of category 3 area.

RECREATION: The current trend in recreation use in the STSA would indicate a continued demand for extensive, backcountry types of recreation. The values sought trend toward semi-primitive-motorized (54,799 acres including Glen Canyon NRA) and primitive (5,561 acres) recreation. These values would be lost because of the intensive industrial development associated with in-situ and surface-mining activities. Increases in the resident population would likely increase the demand for developed recreation facilities, off-road vehicle (ORV) touring, and backcountry exploration. Recreational values would likely approach the rural ROS values under either in-situ or surface-mining development. The rural ROS values are those recreation values characterized by developed facilities, use of motorized equipment, evidences of man's presence,

and encounters between users.

The values sought by non-commercial and commercial survival groups would be eliminated, since they require lands which are undeveloped and isolated from development. An estimated 2,500 visitor days per year would be displaced upon development of tar sand. The natural, scientific, and recreational values attributed to Wolverine Petrified Wood Natural Area and Escalante Canyons Outstanding Natural Area would also be lost under in-situ or surface-mining scenarios. The major use patterns of the Burr Trail could be displaced because of the conflict associated with commercial hauling of oil or tar sand by truck. This displacement of use could reduce visits to the southern portion of Capitol Reef National Park.

Capitol Reef National Park's natural environment zone, the Wolverine Petrified Wood Natural Area, and Escalante Canyons Outstanding Natural Area would receive secondary impacts on existing and proposed recreational values. Primary impacts would include noise, dust, odor, and commercial development adjacent to the Park boundary. Secondary impacts anticipated include those impacts associated with commercial development in backcountry areas (i.e., vandalism, trespass, firearm violations, ORV use, and destruction of archaeological values).

Alternative 1, No Action/Existing Oil and Gas Categories: Potential impacts would be the same as those described above except that the scientific and natural values associated with Wolverine Petrified Wood Natural Area would not be impacted.

Alternative 2, Maximum Development: The impacts described above would occur throughout the STSA.

Alternative 3, Multiple Use (Preferred Alternative): Potential impacts would be as described above, except that the scientific and natural values associated with Wolverine Petrified Wood Natural Area and Escalante Canyons Outstanding Natural Area would be protected by a no surface occupancy stipulation.

Alternative 4, Restricted Development (Resource Protection): Impacts described above would occur. Primary impacts would not be expected to occur in areas where in-situ or surface mining would be prohibited. However, impacts associated with oil and gas development in category 2 areas would occur. Secondary impacts would be expected on Burr Trail, adjacent areas within Capitol Reef National Park, and other protected areas such as Wolverine Petrified Wood Natural Area and Escalante Canyons Natural Area.

CULTURAL RESOURCES: Because of lack of information on the nature and extent of archaeological resources in the STSA, only general impacts can be assessed at this time. Surface mining in the STSA would be destructive of any sites encountered. However, any development would be subject to general operating procedures as described in the Introduction to this chapter. Direct project-related impacts and resource/data loss could be controlled by pre-disturbance intensive inventories combined with avoidance and/or data recovery (salvage).

Importance assigned to this potential loss would depend on densities and site types actually existing in the STSA. In-situ development, while less consumptive overall, is no less destructive on a site-by-site basis.

Indirectly, people-associated impacts would probably be a major concern in protecting this resource. Introducing a large and probably resident work force into a remote, poorly known, and potentially rich archaeological area could lead to considerable abuse of the resource by vandalism. Indirect impacts and losses are generally more difficult to control; commonly used methods include patrol/surveillance and employment conditions in contracts.

Alternative 1, No Action/Existing Oil and Gas Categories: All of the above-mentioned impacts could occur, with the exception of the Wolverine Petrified Wood Natural Area, which would be closed to surface occupancy. Indirect impacts would still occur throughout the STSA.

Alternative 2, Maximum Development: All of the above-mentioned impacts could occur.

Alternative 3, Multiple Use (Preferred Alternative): Indirect impacts to cultural resources would occur. Direct impacts would not occur within the 14,480-acre area protected for scenic and watershed values. About 7,200 acres of the area are considered potentially surface minable and would be subject to direct impacts. Approximately 18,800 acres considered potentially suitable for in-situ mining could receive direct impacts.

Alternative 4, Restricted Development (Resource Protection): Impacts would be the same as those occurring under Alternative 3, except in-situ mining impacts would also be eliminated in the 14,480-acre area protected for scenic and watershed values. It is estimated that about 15,400 acres and 3,440 acres of probable in-situ and surface mining area would be affected, respectively.

LAND USES AND LAND USE PLANS: Changes to existing land uses would occur as described in the Affected Environment Recreation and Livestock Grazing sections in this STSA.

SOCIOECONOMICS: Energy development in the eastern portions of Garfield County would result in significant increases in population and employment, and, correspondingly, increased demands on the local housing and community infrastructure.

The following assessment assumes a production level of approximately 20,000 barrels per day (see Volume 1 for a more complete analysis). This level of development would require a peak construction work force of approximately 1,400 workers and an operational work force of approximately 360 workers (Office of the State Planning Coordinator, 1982). The construction work force would range from 100 persons the first year to 1,400 persons the third year. During the fourth and final year, the work force would fall to 400 persons. The operational work force would remain stable throughout the production life of the STSA.

Much of the required construction work force would be supplied by unemployed resources available in Garfield County, but there would be some short-term influx of construction workers. The operational work force would be comprised of many Garfield County residents; however, the more specialized jobs would most likely be filled by persons from outside the area.

Employment in other economic sectors would also increase in proportion to energy minerals employment. The extent of this increase cannot be estimated using available data, but it is expected that the services and retail trade

sectors would receive the greatest change.

The Utah Office of Budget and Planning (1983) has prepared the following estimates of population impacts to Garfield County assuming the high (20,000 barrels per day) production scenario.

Year	Baseline Population	Population Increases Assuming High Production Level
1985	4,300	0
1990	4,600	292
1995	4,800	1,212
2000	5,000	1,390
2005	5,200	1,466

This increase in population would require additional housing in the eastern portions of Garfield County, especially after 1995. The large increase in population would require a considerable amount of development of the local infrastructure. Financing such large-scale improvements could severely strain the budgets of Garfield County and its

communities. The increased tax revenues following energy development could be sufficient to fund the necessary improvement; however, unless upfront funding was required, funding would come after the bulk of investments were made.

The loss of recreational opportunities and livestock forage resulting from energy development would have a minor impact on the regional economy. Impacts to individuals could, of course, be more significant.

Alternatives 1 and 2: Should all of the tar sand areas be developed as allowed under these alternatives, impacts would be from 7 to 20 times greater than those described above.

Alternatives 3 and 4: Social and economic impacts would be similar to those described above. However, because of the greater restrictions placed on potential development, impacts would be less significant and would probably occur less rapidly. The exact difference in impacts resulting under each alternative cannot be accurately projected until more data are available.

VERNAL DISTRICT

Vernal District was responsible for revising categories on four STSAs: (1) Asphalt Ridge/White Rocks; (2) Pariette; (3) Argyle Canyon/Willow Creek; and (4) Sunnyside (northern portion).

Asphalt Ridge/White Rocks STSA

The White Rocks portion of the STSA is administered by the Forest Service (FS) and the Ute Indian Tribe. This area is not included in this analysis because it will not be involved in the category amendment process.

MAJOR ISSUES

The Asphalt Ridge portion of the STSA includes BLM- and State-administered lands as well as some private surface and mineral rights. All of the Federal land within the Asphalt Ridge portion of the STSA is encumbered by unpatented mining claims and/or proposed in-lieu selection by the State of Utah. These lands have also been identified for disposal under BLM sale procedures. The following two issues were identified for tar sand development in the Asphalt Ridge STSA:

- **Wildlife:** A large sage grouse strutting ground is located within the STSA. This strutting ground and nesting habitat are of special concern and high public interest. Intensive tar sand development would conflict with this resource value.
- **Cultural Resources (Archaeology):** There are four archaeological sites within the STSA which have potential for nomination to the National Register of Historic Places. Intensive tar sand development would conflict with these sites.

ALTERNATIVES

Alternative 1, Development

The 13,169 acres of the STSA administered by BLM would be open to leasing (category 1) under a CHL (see Figure 2-21). This alternative would allow maximum development.

Alternative 2, No Action (Existing Oil and Gas Categories)

Both competitive CHLs and converted leases would comply with the oil and gas categories in the existing MFP. The following lists existing categories and approximate acres in each category for the STSA. Figure 2-22 shows category locations.

Category	Acres	Percent
1	11,449	87
2	1,720	13

Only one issue was identified as part of the oil and gas categorization system established in 1975.

Sage Grouse Strutting Grounds and Nesting Area (Category 2, 1,720 Acres). A large sage grouse strutting ground is located within the STSA. This strutting ground and nesting habitat are of special concern and public interest. Intensive tar sand development would conflict with this

resource value. The affected lands are described as follows:

Township 5 South, Range 21 East, Sec. 21, S $\frac{1}{2}$; Sec. 27, S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 28, All; Sec. 34, All.

Stipulations (category 2 areas):

- No occupancy or surface disturbance will be allowed within 1,000 feet of sage grouse strutting grounds. To protect nesting habitat, exploration, drilling and other development activities will only be allowed between June 30 and April 1 within 1.5 miles of any sage grouse strutting ground. This limitation does not apply to maintenance and operation of producing wells. Exceptions to the nesting habitat restriction in any year may be specifically authorized in writing by the authorized officer of the Federal surface management agency.

Alternative 3, Multiple Use (Preferred Alternative)

This alternative utilizes new resource data and considers the overall value of both the renewable resources and the subsurface mineral resources. The difference between this alternative and Alternative 2 would be the size of the area subject to special stipulations. Some additional stipulations would also be applied.

The following lists the proposed categories and approximate acres in each category for the STSA. Figure 2-23 shows category locations.

Category	Acres	Percent
1	10,609	81
2	2,520	19
3	40	Less than 1

Sage Grouse Nesting Area (Category 2 2,320 Acres).

Township 5 South, Range 21 East, Sec. 20, E $\frac{1}{2}$, E $\frac{1}{2}$ W $\frac{1}{2}$; Sec. 21, W $\frac{1}{2}$, SE $\frac{1}{4}$; Sec. 27, S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 28, W $\frac{1}{2}$, W $\frac{1}{2}$ E $\frac{1}{2}$, -E $\frac{1}{2}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 34, All

Stipulations (category 2 areas)

- To protect important seasonal wildlife habitat, exploration, drilling, and other development activity will be allowed only from July 15 to February 15. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of the surface management agency.
- Oil and gas resources may be extracted by conventional methods only. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of BLM.

Sage Grouse Strutting Ground (Category 3, 40 Acres).

The area described as Township 5 South, Range 21 East, Sec. 28, NE $\frac{1}{4}$ SE $\frac{1}{4}$ would contain the no surface occupancy stipulation.

Cultural Resources (Category 2, approximately 200 Acres). Note: To protect cultural resource values, specific sites are not shown in this document.

Stipulations:

- The Federal surface management agency is responsible for determining the presence of cultural resources and specifying mitigation measures



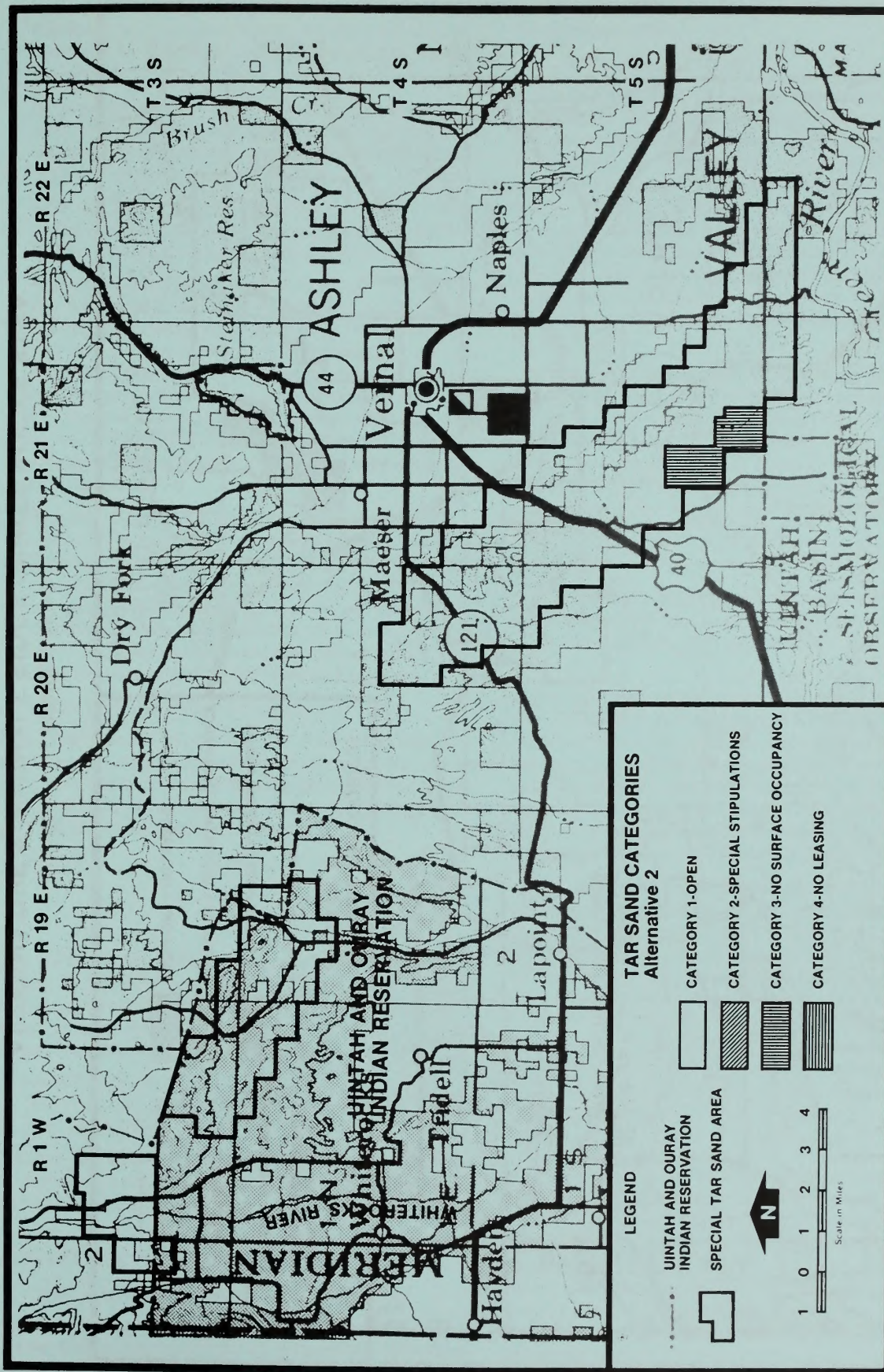


FIGURE 2-22
ALTERNATIVE 2, ASPHALT RIDGE/WHITE ROCKS STSA

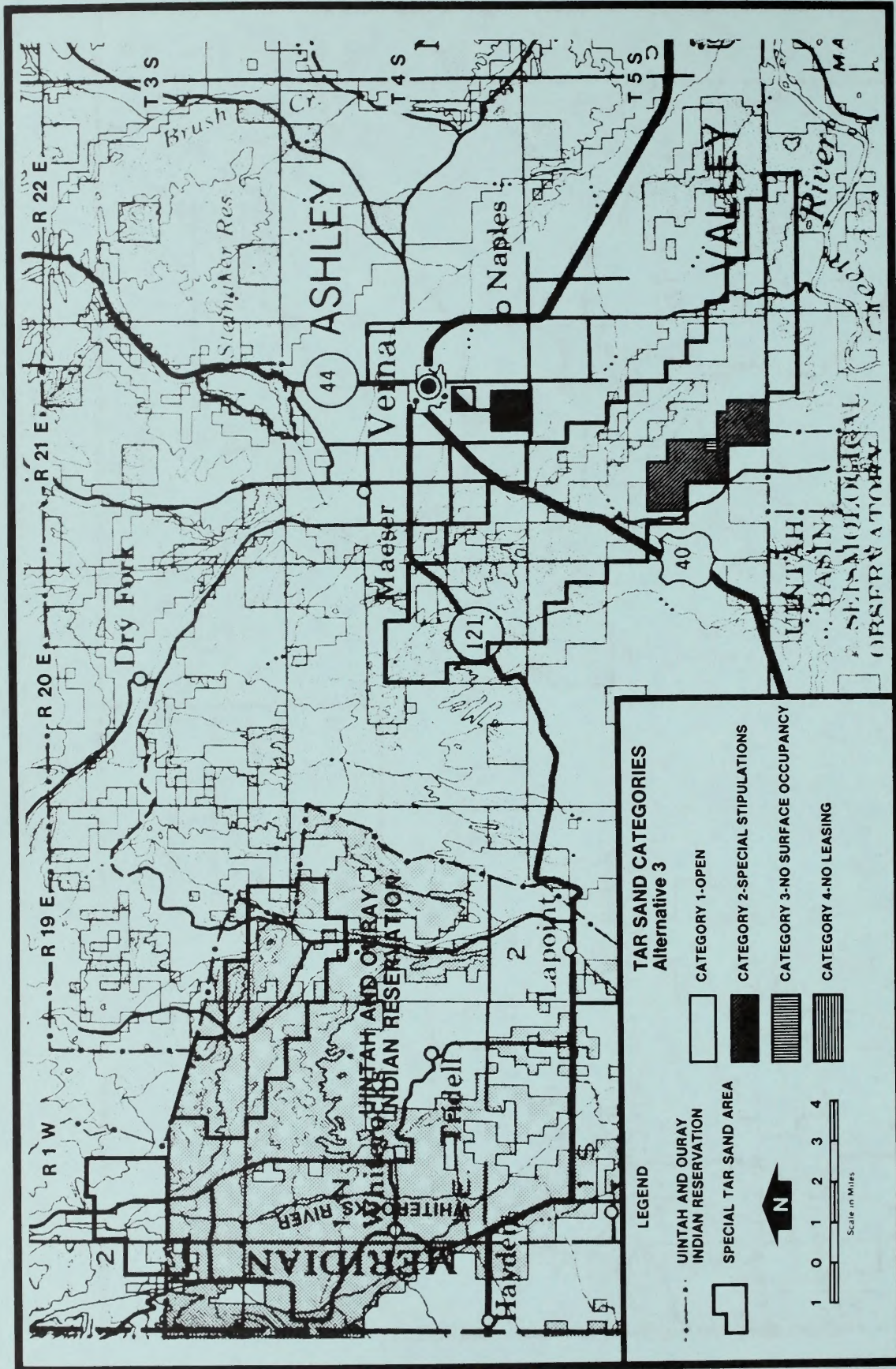


FIGURE 2-23
ALTERNATIVE 3, ASPHALT RIDGE/WHITE ROCKS STSA

ASPHALT RIDGE/WHITE ROCKS STSA

required to protect them. Prior to undertaking any surface-disturbing activity on the lands covered by this lease, the lessee/operator, unless notified to the contrary by the authorized officer of the surface management agency, shall:

- Engage the services of a qualified cultural resource specialist acceptable to the surface management agency to conduct an intensive inventory for evidence of cultural resource values;
- Submit a report acceptable to the authorized officer of the surface management agency and the District Engineer of the Geological Survey; and
- Implement such mitigation measures as required by the authorized officer of the surface management agency to preserve or avoid destruction of inventoried cultural resource values. Mitigation may include relocation of proposed facilities, testing and salvage, or other protective measures deemed necessary. All costs of the inventory and mitigation shall be borne by the lessee/operator and all data and materials salvaged shall remain under the jurisdiction of the U.S. Government.
- The lessee/operator shall immediately bring to the attention of the District Engineer of the Geological Survey and the authorized officer of the surface management agency any cultural resources, paleontological, and other objects of scientific interest discovered as a result of surface operations under this lease and shall leave such discoveries intact until directed to proceed by the District Engineer.

Alternative 4, Restricted Development

More emphasis on protecting the renewable resource values and existing surface environment is applied under this alternative. The following lists the proposed categories and approximate acres for each category in the STSA. Figure 2-24 shows locations of categories.

Category	Acres	Percent
1	10,609	81
3	2,560	19

Sage Grouse Strutting Ground and Nesting Areas (Category 3, 2,360 Acres). The birds are most concentrated in an area approximately 2 miles in radius around the strutting ground. Any lease issued in the following area would contain the no surface occupancy stipulation:

Township 5 South, Range 21 East, Sec. 20, E $\frac{1}{2}$, E $\frac{1}{2}$ W $\frac{1}{2}$;
Sec. 21, W $\frac{1}{2}$, SE $\frac{1}{4}$; Sec. 27, S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$;
Sec. 28, All; Sec. 34, All.

Cultural Resources (Category 3, 200 Acres). The 200 acres identified but not displayed in this document would be subject to the no surface occupancy stipulation.

AFFECTED ENVIRONMENT

Geology and Topography

Asphalt Ridge is a northwest-trending cuesta about 15 miles long. Oil impregnation occurs in two rock units along approximately 13 miles of the ridge. The ridge consists of resistant Mesa Verde sandstones and shales. The upper part of the Mesa Verde is truncated by less steeply dipping

Duchesne river beds of Eocene-Oligocene ages. The rocks dip from 8 to 12 degrees southwesterly (Untermann and Untermann, 1964).

Air Quality and Climate

The STSA is within a Class II air quality designation. This designation allows for moderate deterioration normally accompanying well-controlled growth. Dinosaur National Monument, 12 miles to the northeast, has been recommended for Class I designation. Vehicles, stoves and fireplaces, space heating, and other sources from the Vernal area cause pollutant emissions. The Deseret Power Plant being built near Bonanza will be a major pollutant source. In addition, several oil shale and tar sand projects have also been proposed nearby. The impact of these sources is addressed in detail in the Uinta Basin Synfuels EIS (USDI, BLM, 1983c).

Annual precipitation on Asphalt Ridge ranges from 6 to 8 inches, with more accumulation during April-June than any other 3-month period. Temperatures in Vernal range from -38°F in winter to 103°F in summer. The June-September frost-free season averages approximately 120 days. Temperature inversions commonly occur in winter and cause air stagnation in the Vernal area for periods ranging from 1 week to 2 months.

Soils

Major soils in this unit are Rencot, Brownsto, and Luhon, which make up about 75 percent of the area. The remaining 25 percent is made up of rock outcrop, badlands, and minor soils.

Topography consists primarily of hillsides and fan terraces with slopes ranging from 0 to 60 percent. Slopes are dominantly 8 to 25 percent. About 50 percent of the area has deep soils, while the remaining soils are shallow. Rencot soils are shallow and well drained, with an extremely gravelly sandy loam surface layer. The underlying layers are a mixture of gravelly loam and extremely gravelly, sandy loam laying on conglomerate rock at a depth of about 18 inches.

Brownsto soils are very deep and well drained with a very gravelly loam surface layer. Underlying layers are a mixture of gravelly loam, very cobbly sandy loam, and very cobbly sandy clay loam to a depth of 60 inches or more. Luhon soils are very deep, well drained, and have a very gravelly loam surface layer. The underlying layers are a mixture of loam, gravelly loam, gravelly clay loam, and very gravelly loam to a depth of 60 inches or more. Soil productivity is generally low. Reclamation potential on the shallow Rencot soils is poor, on the gravelly Brownsto soils is fair, and on the loamy Luhon soils is good.

Vegetation

There are two dominant vegetation communities within this STSA. Juniper on the hills and fan terraces gives way to a mixed shrub community on the more level terrain. Within the juniper community, undergrowth is perennial, although sparse and severely limited by competition for available moisture. The mixed shrub community is dominated by sagebrush, with some shadscale and horsebrush. Grasses within the juniper community are predominantly Indian ricegrass and needle-and-thread grass. Bottlebrush, squirreltail grass, several bluegrass species, isolated pockets of needle-and-thread grass, and cheatgrass dominate in the mixed shrub community.

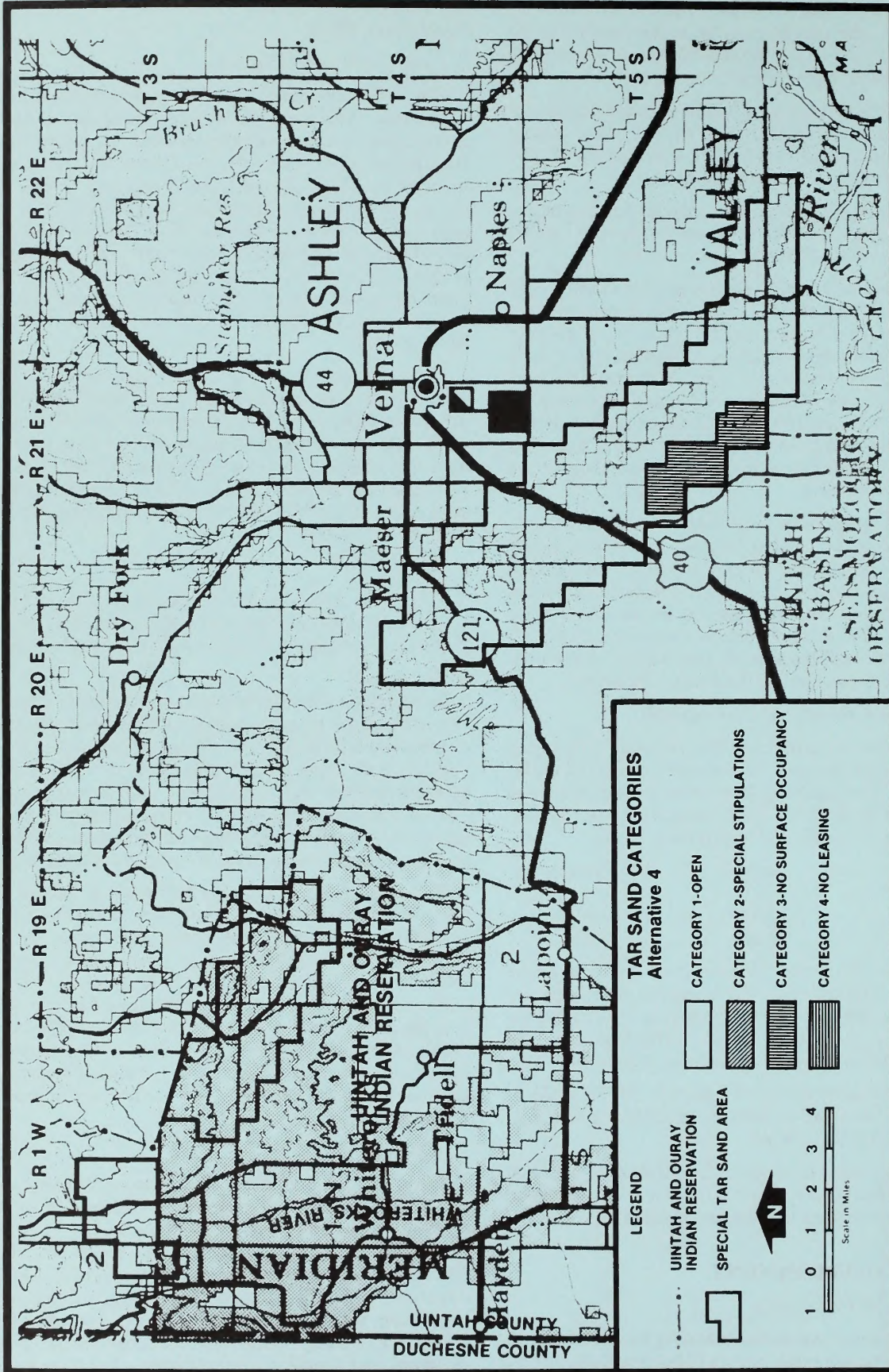


FIGURE 2-24
ALTERNATIVE 4, ASPHALT RIDGE/WHITE ROCKS STSA

There are no threatened and endangered plant species known to occur within this STSA.

Livestock and Agriculture

Five permittees graze sheep (481 AUMs) on five allotments which fall totally or partially within the STSA. Table 2-13 summarizes livestock grazing data for the STSA. There are no agricultural lands within the STSA. Agricultural activity occurs on private lands immediately east of the STSA.

Water Resources

No seeps or springs are known to occur within the STSA. However, BLM has water filings on several reservoirs used for stockwatering within the STSA. These are important water sources for livestock in winter and spring, especially during years of little or no snow. No wetlands or floodplains are found within the STSA. However, the southern boundary of the STSA passes within 0.50 mile of the Green River floodplain. Groundwater in the STSA is found in shallow, consolidated, and unconsolidated geologic deposits. Local and areawide water flow direction and properties of aquifers are not known.

Minerals

TAR SAND: The areal extent of the Asphalt Ridge deposit is estimated by Ritzma (1979) at 20 to 25 square miles. Wells drilled more than mile down dip from the outcrop have encountered saturated tar sand.

The greatest uninterrupted thickness, 120 feet of oil-saturated sandstone, occurs in Rim Rock sandstone at the northwest end of Asphalt Ridge. Oil impregnation at the county asphalt quarry was 190 feet. Many individual oil-bearing sands of varying thicknesses and lateral continuities occur in the Duchesne River formation. The gross saturated interval is as much as 125 feet thick, and individual saturated units are as high as 40 feet thick. Ritzma (1979) reports the gross thickness of saturated rock to range from 10 to 135 feet.

Because the bituminous sandstones dip southwestward and have increasingly deep cover, only a small part of the sandstone can be mined by surface mining methods. Mining would be limited to a long, narrow band along the strike of the ridge.

The Asphalt Ridge deposits are well suited to thermal recovery techniques because the Rim Rock sandstone has excellent reservoir characteristics. Thermal recovery is less likely to succeed in the Tertiary sedimentary rocks because they are less permeable than the Cretaceous sedimentary rocks. Also, the Tertiary sandstones are irregular and lenticular. The Asphalt Ridge deposit has good oil saturation, good pay thickness, low sulfur content, and excellent water availability from the Green River.

OIL AND GAS: Some wells were drilled to explore for oil and gas on and near Asphalt Ridge STSA, but no production has been recorded.

SALEABLE MINERALS: There are three small areas within the STSA, each containing 80 acres or less, which are valuable for sand and gravel. No other saleable minerals are present.

LOCATABLE MINERALS: Oil placer claims were located on nearly all of the tar sand outcrops on Asphalt Ridge prior to 1920. No other locatable minerals are known

to occur within the STSA.

Wildlife

BIG GAME: It is estimated that 125 mule deer use the STSA on a yearlong basis. They are found primarily in the pinyon-juniper belt adjacent to agricultural lands on the eastern side of the area. An estimated herd of 50 antelope are found on the sagebrush benches on the western side of the STSA. The STSA provides a very small portion (less than 10 percent) of the habitat required for the herd unit.

UPLAND GAME: Cottontail rabbits are abundant throughout the area, as are mourning doves during the summer months. California quail and ring-necked pheasants are common near the agricultural fields near the east side of the STSA. A sage grouse strutting ground is located on a sagebrush bench on the west side of the STSA. Most nesting activity probably occurs within 2 miles of the strutting ground.

NON-GAME SPECIES: A variety of non-game species (i.e., coyote, black-tailed jackrabbits, and white-tailed prairie dogs) are present in the STSA. Marsh hawks, prairie falcons, red-tailed hawks, Swainson's hawks, and American kestrels are common in the STSA and probably nest in the area. Ferruginous hawks, merlins, rough-legged hawks, goshawks, Cooper's hawks, and sharp shinned hawks are frequent visitors.

ENDANGERED AND SENSITIVE SPECIES: A golden eagle (a sensitive species) nest is located on State-administered land in Township 4 South, Range 21 East, Sec. 31. No known golden eagle nests occur on BLM-administered lands. The presence of white-tailed prairie dogs in the vicinity of the STSA may indicate the presence of black-footed ferrets (endangered species). However, sightings of this species have not been confirmed.

Cultural Resources

Approximately 2,520 acres on Asphalt Ridge were inventoried by personnel from Nickens & Associates during June 1981. Nineteen prehistoric sites and 22 isolated finds were recorded. On 15 of the sites, the cultural affiliation is unknown, two sites are Fremont, one is a multiple cultural occupation by prehistoric/ethnohistoric peoples. Of the 19 sites, three were considered eligible to the National Register of Historic Places, two needed further testing to determine eligibility, and 15 were considered ineligible. These sites are all on lands administered by BLM. Legal descriptions have been determined; however, to protect these cultural values from vandalism, disturbance, etc., it is BLM policy not to identify these sites or the 40-acre block buffer zone until data have been collected and significance determined. Site density is computed at 4.82 sites per square mile, a relatively high number for the Uinta Basin (Nickens, 1981). The unsurveyed areas can be expected to produce similar types of sites and site densities. Surveys by BLM personnel on the southern end of Asphalt Ridge indicate that similar site types are commonly found, including rock art and possible structured sites of Fremont/Anasazi cultural affiliation.

Visual Resources

Asphalt Ridge is viewed from Highways 40 and 121, the principal travel corridors. Scenic quality has been evaluated as C (low) with medium sensitivity. Resulting VRM class is IV, which indicates that man's activities are evident.

CHAP 2: ALTERNATIVE EVALUATIONS

TABLE 2-13

Livestock Grazing Data
for the Asphalt Ridge/White Rocks STSA

Allotment	Class of Livestock	Season of Use	Federal AUMs Within the STSA	Percent of Allotment Total ^a
Asphalt Ridge	Sheep	2/22-2/28	54	100
Twelve Mile	Sheep	2/01-4/20	22	5
Cook	Sheep	1/10-4/10	187	22
Powell (12 mile)	Sheep	1/10-4/10	89	68
Holmes-Palmer	Sheep	2/01-4/27	129	100

Source: USDI, BLM, 1983a.

^aWithin the STSA.

Recreation

Opportunities exist to hunt sage grouse, deer, antelope, and rabbits. ORV use occurs in some areas. No developed recreation sites exist. Opportunity exists for viewing Ashley Valley from a State overlook along Highway 40.

Wilderness

No WSAs have been identified in this STSA.

Land Uses and Land Use Plans

Existing land uses within the STSA include grazing and limited ORV use. Also, numerous rights-of-way exist including Highway 40, State Route 121, the new State route to Bonanza, powerlines, and communication sites. The BLM Ashley Creek/Duchesne MFP was completed in 1983. Uintah County does not have a land use plan.

Socioeconomics

The area of influence for socioeconomics encompasses Duchesne, Grand, and Uintah Counties in Utah. Also included are the incorporated communities of Myton, Ballard, Vernal, Naples, and Roosevelt, and the Uintah and Ouray Indian Reservation.

Other areas and unincorporated communities located in the Ashley Valley, such as Jensen and Maeser, could be significantly affected. However, data specifically associated with these areas are limited. Uinta Basin Synfuels Development Final Technical Reports (Utah Office of Budget and Planning, 1983) gives some data on projected baseline population and employment for the unincorporated areas of the Ashley Valley. This report also presents population and employment impacts.

The Uintah and Ouray Indian Reservation is part of the identified area of influence. It is located in the Uinta Basin counties of Uintah, Duchesne, Wasatch, and Grand. The Reservation possesses the power of a sovereign state under treaties and Acts of Congress. It is composed of 1,039,010 acres of tribal lands, with an additional 430,000 acres of mineral and subsurface rights. Because the State of Utah and the Uintah and Ouray Indian Reservation have different standards and procedures for recording their social and economic statistics, it is not possible to fully quantify baseline data and baseline projections for all aspects of the reservation's socioeconomic environment. In the following discussion, baseline conditions on the reservation are described qualitatively where specific baseline data are unavailable.

POPULATION AND EMPLOYMENT: Tables 2-14 and 2-15 present baseline population and employment information for the impacted area. Baseline projections assume only trend growth without the effects of specific developments. In 1980, the population of the area was 33,087. Uintah County had the largest population, comprising 62 percent of the area's total population. The largest community in the region is Vernal, Utah. Its population in 1980 was 6,600; it comprised 32 percent of the Uintah County population. The majority of population in the area ranges between the ages of 35 and 44. Of the small proportion of minorities within the total population, members of the Ute Indian Tribe comprise the largest percent. The over-65 age group is also a very small portion of the total population.

Future population projections (Table 2-14) indicate that the affected area will grow most rapidly between 1980 and

1985. Currently, the annual growth rate during this period is estimated at 5.3 percent, as compared to an estimate of 1.2 percent during 1985 to 1995.

The total employment for the affected area in 1980 was 13,376 workers (Table 2-14). Uintah County had the greatest proportion, with 63 percent. Future employment increases will follow the same trends as population (i.e., employment will increase most during the 1980 to 1985 period). Unit 1 of the Bonanza Power Plant, now under construction, will be a substantial contributor to Uintah County baseline growth, while the expansion of the oil and gas industry will be the major force behind Duchesne County's rapid growth during 1980 to 1985.

The Ute Indian Tribe currently has 1,890 enrolled tribal members. (To qualify as an enrolled tribe member of the Ute Indian Tribe, a person must have at least 5/8 part Ute Indian blood. This degree of Indian blood is established by tribal law.) The tribe's population has increased significantly through the last decade, from 1,292 members in 1972 to 1,890 members in 1981, a 46-percent increase. In 1980, 85 percent of the enrolled tribal members lived on or near the reservation. An additional 420 Indians live on or near the Uintah and Ouray Indian Reservation but are not enrolled Ute tribal members. However, they may be members of other federally recognized Indian tribes.

The Uintah and Ouray Indian Reservation has experienced out-migration rather than in-migration because of the lack of attracting economic opportunities. Because of out-migration of young adults for economic reasons and a relatively short average lifespan, the Indian population is predominantly young. About 73 percent of the Indian population is 34 years or younger; the over-65 age group comprises only 4 percent of the total population. Another factor contributing to the young-age structure is that many young adults return to the reservation with a family after leaving single because of difficulties in adjusting to non-reservation life.

A total of 432 enrolled Ute tribal members are employed. Fifty-two percent (462) of the potential Indian labor force (894) is unemployed. This is mainly caused by the lack of economic opportunities on the Reservation. A large share of the unemployed Utes have become discouraged and are no longer actively seeking work. Virtually all of the 432 employed tribal members work for either the tribe, the Bureau of Indian Affairs, or a tribal enterprise. The tribe lists fewer than ten Ute members currently working in the oil and gas industry.

PERSONAL INCOME: In 1979 (latest data available), average per capita personal income (PCPI) for the socioeconomic area of influence was \$8,596 (1980 dollars). This is 95 percent of the average income of Colorado and Utah (\$9,091). The Colorado area had the highest PCPI (\$9,977), while Duchesne had the lowest PCPI (\$7,161).

Future baseline projections indicate an increase of the PCPI for the affected area. For 1985, the increased PCPI (in 1980 dollars) is projected at \$10,637. In 1995, this is projected to increase to \$11,400. Most of the increased income will result from moderate expansion in the mining sector.

Of the 432 employed Ute tribal members, about 152 workers (35 percent) earn less than \$7,000 per year, and 280 (64 percent) earn \$7,000 per year or more. Some studies indicate that Indian households are larger than non-Indian

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TABLE 2-14

Historic and Baseline-Projected Population and Employment Data
for Duchesne and Uintah Counties

	Counties		Total
	Duchesne	Uintah	
<u>1980</u>			
Population	12,565	20,522	33,087
Employment	4,893	8,483	13,376
<u>1985</u>			
Population	17,778	25,730	43,508
Employment	7,203	10,585	17,788
<u>Annual Change 1980-85</u>			
Population (percent)	6.9	4.6	5.6
Employment (percent)	8.0	4.5	5.8
<u>1993</u>			
Population	18,712	29,982	48,694
Employment	7,057	11,895	18,952
<u>Annual Change 1985-93</u>			
Population (percent)	0.6	1.9	2.3
Employment (percent)	-0.2	1.5	1.3
<u>1995</u>			
Population	18,684	29,863	48,547
Employment	7,070	11,886	18,956
<u>Annual Change 1985-95</u>			
Population (percent)	0.5	1.5	2.2
Employment (percent)	-0.1	1.2	1.3

Source: U.S. Department of Commerce, Bureau of the Census, 1980.

Note: Data indicate that Indian populations comprised the following percentage of total populations in 1980: Roosevelt, 2 percent; Myton, 7 percent; Ballard, 3 percent; remainder of Roosevelt CCD, 3 percent; remainder of Uintah-Ouray CCD, 46 percent.

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TABLE 2-15

Historic and Baseline-Projected Population Data
for Ashley Valley

Community	1980	1985	Annual Change 1980-85 (Percent)		1993	Annual Change 1985-93 (Percent)		1995	Annual Change 1985-95 (Percent)	
Vernal	6,600	9,291	7.1		11,421	2.6		11,369	2.0	
Roosevelt	3,842	5,416	7.1		5,948	1.2		5,934	0.9	
Ballard	558	775	6.8		985	3.0		976	2.3	
Myton	500	705	7.1		775	1.2		773	0.9	
Rangely	2,126	3,193	8.5		3,725	1.9		3,805	0.3	
Dinosaur	312	501	9.9		420	-2.2		425	-1.7	

Source: U.S. Department of Commerce, Bureau of the Census, 1980.

Note 1: Data indicate that Indian populations comprised the following percentage of total populations in 1980: Roosevelt, 2 percent; Myton, 7 percent; Ballard, 3 percent; remainder of Roosevelt CCD, 3 percent; remainder of Uintah-Ouray CCD, 46 percent.

Note 2: The Naples area in Ashley Valley was recently incorporated into Naples City. Detailed population data are not currently available. Therefore, information in this EIS will be considered as part of Uintah County.

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households: the average Indian household size ranges from 4.0 to 5.6 persons. When considering the large household size and generally low personal income, the average PCPI would be very low and, in many cases, below the poverty level.

HOUSING: Based on data supplied by the Utah Office of Budget and Planning (1983), 68 percent of the dwelling units in Uintah and Duchesne Counties are single-family, 21 percent are mobile homes, 4 percent are multi-family, and the remaining 7 percent are hotel or motel accommodations. Mobile homes provide a large share of the housing market in the area. Although their utilization had been on a steady decline since the mid-1970s, the trend reversed in 1980 when construction on the Bonanza Power Plant began.

Based on the Uintah Basin Association of Government's housing survey completed in August 1981, 92 percent of the housing within Uintah and Duchesne Counties is in standard or new condition. Uintah County had the most rapid rate of new housing growth, 40 percent from 1976 through 1981. Table 2-16 lists historic and baseline projections for housing demand changes for Uintah and Duchesne counties between 1980 and 1995. As seen from the table, housing demand should be strong in all areas up to 1995. After this point, the expansion of demand should significantly decline.

There is currently a shortage of adequate housing within the Uintah and Ouray Indian Reservation. There are 55 families in need of housing and 42 dwelling units that need to be completely replaced. Another 50 dwelling units need to be renovated, while 315 dwelling units are in good repair. Since 1964, the Department of Housing and Urban Development (HUD) and the Ute Indian Housing Authority, through formation of the Mutual Help Project, have made significant improvements in the Reservation's housing. The Mutual Help Project had completed construction of 220 ownership units and 70 rental units as of September 30, 1981. The Special Projects Office of the Ute Tribe has also renovated and repaired 149 homes, primarily using HUD discretionary grants.

QUALITY OF LIFE: Most of the social effects associated with continued development would occur in Uintah and Duchesne counties. Because of oil and gas activity over the last several years, these counties have already experienced a moderate level of industrialization and significant population growth. The experience gained from shifting the local economic base from agriculture to industrial uses should be a valuable asset to both officials and residents (Mountain West Research, 1982). The traditional Western farming and ranching communities are losing their identity because of recent energy development. Despite a high proportion of Mormon residents, the importance of this factor in community life is declining, as large numbers of newcomers have entered the communities (USDI, BLM, 1983a).

Social changes are already evident; the communities have become more diverse, segmented, and impersonal. Attitudes toward growth among leaders and residents are very positive, but there is uncertainty as to whether tar sand development will really occur. There appears to be limited misgivings among residents about the social costs and benefits of growth. However, most residents in the area favor the growth of industry and the associated jobs (APA Planning and Research, 1981).

Services are already strained by oil and gas-induced

growth and likely will be further stressed during the next several years. Housing, education, law enforcement, mental health, and similar services and facilities are under considerable pressure. Community leaders face growth management problems at this time.

Existing living conditions (i.e., housing, employment opportunity, education achievement, and similar factors) on the Uintah and Ouray Indian Reservation are of concern to the Ute Tribe. Disparity between on-reservation and off-area economy contributes to the feeling among some tribe members of being materially deprived. Culturally, it appears that the work ethic and competitive drive for economic well being are not supported or rewarded to the same extent for Indians as for non-Indians (National Institute for Socioeconomic Research, 1982).

ENVIRONMENTAL CONSEQUENCES

Tar Sand and Oil and Gas Resources

The Asphalt Ridge STSA is considered to have high potential for tar sand development through surface mining and moderate to low potential for in-situ development. There are no major oil and gas fields and no production of oil and gas within the STSA. Once development of tar sand commenced, future options for use of oil and gas would be foregone.

ALTERNATIVE 1, DEVELOPMENT: Under this alternative, 100 percent of the tar sand under BLM administration would be available for development (see Figure 2-21). However, even in category 1 (open to leasing) a plan of operation would have to be approved by BLM. That approval process places constraints and stipulations on operational activities to protect environmental concerns. Beyond the standard stipulations listed in Appendix 1, these constraints cannot be determined at this time.

ALTERNATIVE 2, NO ACTION (EXISTING OIL AND GAS CATEGORIES): The potential for development of tar sand is the same in Alternative 2 as Alternative 1 with the exception of the 270 acres placed in category 2 to protect the sage grouse strutting area (see Figure 2-22). Therefore, this area would not be available for tar sand development. However, because of the depth of the tar sand deposit and the low potential for economic development in this area, the category 2 determination would be expected to have a low impact on possible development of the tar sand resource.

There are no producing oil and gas wells in the vicinity of the sage grouse strutting ground and brooding habitat. Since abandoned wells in the area suggest a low potential for conventional oil and gas recovery, it would be unlikely that impacts to oil and gas would occur.

ALTERNATIVE 3, MULTIPLE USE (PREFERRED ALTERNATIVE): Hydrocarbon development could occur on 10,609 acres (81 percent) of the area (see Figure 2-23). Development would be restricted on 2,560 acres (19 percent) and would be precluded on 40 acres (4 percent). However, the impact on tar sand and oil and gas would be expected to be slight, as explained above.

ALTERNATIVE 4, RESTRICTED DEVELOPMENT: This alternative would restrict both tar sand and oil and gas development on 2,560 acres with a no surface occupancy stipulation (see Figure 2-24). The impact to

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TABLE 2-16

Historic and Baseline-Projected Housing Demand
for Uintah and Duchesne Counties

Area	1980	1985	Annual Change 1980-85 (Percent)		Annual Change 1985-93 (Percent)		Annual Change 1985-95 (Percent)	
			1993		1995			
Uintah County	6,162	7,706	4.6	8,591	1.4	8,707	0.3	
Duchesne County	3,773	5,323	7.1	5,385	0.2	5,393	0.1	
Total	9,935	13,029	5.6	13,976	1.4	14,100	0.2	

Source: U.S. Department of Commerce, Bureau of the Census, 1980.

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these resources would be expected to be low, as explained in Alternative 2. By restricting surface mining, this alternative could preclude future development unless technology later provided an economical method of extraction.

Other Minerals

The area is considered to have no significant locatable or saleable mineral deposits and shows no commercial production for conventional oil and gas. None of the alternatives should affect other minerals.

Other Resource Values

AIR QUALITY: Many of the problems (i.e., wind-blown particulates associated with coal surface mining) would be similar to surface mining of coal. Additionally, surface extraction processes (hot water, solvent, and surface retorting) would require the introduction of heat. These boilers or furnaces would probably be fired by residual oil or coal and would result in emissions of SO₂, NO, NO₂, and particulate matter. Removal of any ash, coke, waste water, or other materials would require adequate controls.

In-situ technologies could also result in air quality impacts. Both the steam-drive and fire-flooding processes burn coal or the produced crude to operate engines driving the steam generators or air compressors. The combustion process results in the production of SO₂ and particulate matter and the formation of NO and NO₂. Analysis of detailed air quality impacts are addressed in detail in Volume I of this EIS.

GEOLOGY AND TOPOGRAPHY: Surface mining would irreparably alter existing topographic features along Asphalt Ridge. The Ridge would be removed and drainage areas would be lost by overburden removal or filling by waste disposal. Reclaiming to original contours or blending reclaimed areas with adjacent undisturbed areas would be highly unlikely. In-situ or conventional oil and gas development would not result in major impacts to the topography; however, a few feet of subsidence could occur.

Alternatives 1, 2, 3, and 4: All of the above-mentioned impacts would be expected. Seasonal restrictions in Alternatives 2 and 3 would not lessen the impacts to topography; however, no impacts would occur on the 2,560 acres placed under no surface occupancy in Alternative 4.

SOILS: There would be removal and respreading of the surface soil by surface mining, which would increase soil erosion. Conventional oil and gas and in-situ development of tar sand would require an unknown amount of temporary alteration of top soils wherever roads, drill pads, and other surface facilities were situated. Reclamation potential would range from poor to good because of the poor soil productivity.

Alternative 1, Development. This alternative would allow development on all 13,169 acres administered by BLM, and impacts mentioned above could occur.

Alternative 2, No Action (Existing Oil and Gas Categories). Impacts would be the same as Alternative 1, except 1,720 acres, including a sage grouse strutting ground, would be placed in category 2.

Alternative 3, Multiple Use (Preferred Alternative). Impacts would be essentially the same as those mentioned under Alternative 1. However, 2,520 acres would be placed in category 2 and 40 acres would be closed to surface

occupancy.

Alternative 4, Restricted Development. This alternative would restrict surface occupancy on 2,560 acres where impacts to soils would not occur.

VEGETATION : Surface mining would have more extensive impacts to vegetation than in-situ development because of increased area disturbance and loss of topsoil. Because of poor soil productivity, revegetation would be slow and difficult, especially with the low rainfall (8 inches per year). Success could not be expected for 20 years after planting in most of the area. In-situ development methods would reduce the total acreage of vegetation disturbed; however, revegetation would still be slow and difficult.

Alternative 1, Development. Vegetation could be disturbed on the entire 13,169 acres open to leasing (category 1) under a CHL. The extent of disturbance would depend on the kind and extent of mining operation.

Alternative 2, No Action: Under this alternative, 11,449 acres (87 percent) would be open to leasing, and 1,720 acres would be restricted from development during certain periods of the year to protect the sage grouse nesting area. However, some disturbance to vegetation could occur during the remaining portion of the year.

Alternative 3, Multiple Use (Preferred Alternative): Disturbance to vegetation could occur on 13,129 acres, including the 2,520 acres where seasonal restrictions occur. No disturbance would occur on the 40 acres closed to surface occupancy.

Alternative 4, Restricted Development. There would be no surface occupancy on 2,560 acres (19 percent of the STSA).

WATER RESOURCES: Because no seeps, springs, wetlands, or floodplains are known to occur within the STSA, tar sand development would not be expected to impact surface water. Surface mining probably would not impact any deep groundwater aquifer; however, small shallow alluvial aquifers could be lost because of tar sand and overburden removal. In-situ mining could impact aquifers through injection of solvents and steam or burning, which would affect groundwater quality in the tar sand zone. Aquifer flows could change or dry up because of subsidence.

Alternative 1, Development. All of the above-mentioned impacts could occur because of tar sand development throughout the STSA (13,169 acres); however, since only a small amount of in-situ development would be expected to occur on the west side of the STSA, impacts to surface water would not be expected. Impacts to groundwater resulting from in-situ extraction, as described above, would be expected wherever this type of development occurred.

Alternative 2, No Action: The above-described impacts from tar sand development could occur on 11,449 acres (87 percent of the STSA). Only impacts to groundwater from in-situ development would be likely.

Alternative 3, Multiple-Use (Preferred Alternative): Impacts as described above under Alternatives 1 and 2 could occur on all but the 40 acres closed to surface occupancy.

Alternative 4, Restricted Development. Impacts would not occur on the 2,560 acres closed to surface occupancy.

WILDLIFE: Impacts to wildlife in the STSA would occur in several different ways: (1) direct loss of habitat from mining, road construction, etc.; (2) reduced quality of habitat where revegetation is extremely slow or impossible; and (3) secondary impacts from increased human access and disturbance. Should surface mining of hydrocarbons take place in the Asphalt Ridge STSA, mule deer habitat in the Asphalt Ridge area of herd unit 26 would be severely impacted. These impacts would be permanent, and mule deer would be lost or displaced from the area permanently.

Sage grouse would be severely impacted in the STSA. One strutting ground and the associated nesting area would be lost to surface disturbance. This would represent approximately 50 percent of the total sage grouse population in the area. Cottontail rabbit and mourning dove habitat would also be lost to surface disturbance. California quail and pheasants would not be greatly impacted by surface disturbance but could be affected by secondary impacts from increased human access and disturbance.

Non-game wildlife which use the STSA during all or parts of their life cycles would be lost or permanently displaced by surface-disturbing activities. Raptors within the STSA would be reduced in numbers and habitat lost, depending upon the extent of tar sand development.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES: Surface disturbance and human activity in the vicinity of the golden eagle and prairie falcon nest sites could cause a reduction in available prey species and result in nest abandonment. Surface disturbance in white-tailed prairie dog colonies would result in the loss of potential black-footed ferret habitat.

Alternative 1, Development: All of the above-mentioned impacts would occur.

Alternative 2, No Action (Existing Oil and Gas Categories): Tar sand development could occur in category 1 areas, which covers approximately 87 percent of the STSA. The following impacts would still occur: (1) most of the mule deer range would be subject to disturbance, resulting in a reduction of herd size; (2) any raptors in category 1 areas would be affected as mentioned above; and (3) cottontail rabbit and non-game habitat would be affected as mentioned above.

The existing stipulations provide some measure of protection on 1,720 acres of sage grouse habitat. The strutting grounds would be protected with a 1,000-foot no occupancy buffer zone, and new development activities would be restricted within 1.50 miles of the strutting grounds during the critical nesting period (from April 1 to June 30).

Alternative 3, Multiple Use (Preferred Alternative): Tar sand development would be allowed on 81 percent of the STSA (category 1 areas only). Impacts to mule deer range would occur as mentioned above. Mule deer populations would be reduced. Impacts to sage grouse would be mitigated by restricting surface occupancy on known strutting grounds (40 acres) and prohibiting surface disturbance in the nesting area (2,328 acres) during critical periods of the year. Impacts to raptors, cottontail rabbits, mourning doves, and non-game species in the STSA would be as mentioned above.

Alternative 4, Restricted Development: Approximately 81 percent of the STSA would be in category 1 and, therefore, would be open to hydrocarbon development. Impacts

to sage grouse would be mitigated by restricting surface occupancy on the strutting ground and adjacent nesting area. Impacts to mule deer, other upland game, raptors, and non-game species would be as mentioned above.

LIVESTOCK AND AGRICULTURE: Large-scale tar sand development could result in a total loss of 183 AUMs for Asphalt Ridge and Holmes-Palmer allotments. Substantial reductions in AUMs could occur on Powell (Twelve Mile) and Cook allotments. The livestock operators on these allotments could experience some economic loss should large-scale development occur.

Alternative 1, Development: All of the above-mentioned impacts would occur.

Alternative 2, No Action: Impacts mentioned above would occur.

Alternative 3, Multiple Use (Preferred Alternative): Impacts mentioned above would occur in category 1 areas. Category 2 areas, with the seasonal restriction on surface disturbance, would receive some mitigation; however, the above-mentioned impacts would still occur. The 40 acres closed to surface occupancy would not be impacted.

Alternative 4, Restricted Development: No surface-disturbance activities would occur on 2,560 acres because of the additional stipulations. Impacts would still occur on the remaining 10,609 acres.

VISUAL RESOURCES: Acknowledging the developments that currently exist in and around Vernal and Ashley Valley, tar sand development would have a minimal impact when considering overall activities. However, parts of Asphalt Ridge are in the foreground of travelers using U.S. Highway 40 and State Highway 121, and landform modification or visible support facilities would be seen if not screened from view. It is expected that hydrocarbon development would meet the VRM Class IV objectives under any alternative.

Alternative 1, Development: This alternative would maximize disturbance to the landscape. Landform modification could be extensive and could become a focal point for viewers along U.S. Highway 40 in particular.

Alternative 2, No Action: Impacts would be similar to Alternative 1.

Alternative 3, Multiple Use (Preferred Alternative): With the exception of the 40-acre no surface occupancy area, impacts would be the same as Alternative 1.

Alternative 4, Restricted Development: Visual impacts would not occur on 2,560 acres closed to surface occupancy.

CULTURAL RESOURCES: Hydrocarbon development could result in various types of activities which would impact archaeological values. This includes: (1) surface mining; (2) drill pads; (3) support facilities; (4) rights-of-way for pipelines, powerlines, and roads; and (5) waste disposal. Secondary impacts to archaeological values could be expected through vandalism and increased human activity.

Alternative 1, Development, and Alternative 2, No Action: Subject to general operational procedures as described in the Introduction to this chapter, all of the above-mentioned impacts could occur.

Alternative 3, Multiple Use (Preferred Alternative):

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Impacts would be similar to Alternative 1. However, impacts to the three significant and two potentially significant sites would be avoided. Insignificant or undiscovered sites could be destroyed. Secondary impacts could still be expected.

Alternative 4, Restricted Development: No surface disturbance would preclude direct impacts to archaeological values on 2,560 acres. Three significant and two potentially significant sites are located in this area. Potential loss of insignificant and undiscovered sites could still occur. However, secondary impacts could still be expected.

RECREATION: Recreation pursuits along Asphalt Ridge are primarily centered around hunting and some ORV use. However, other suitable areas are available near Vernal for ORV activity; therefore, significant impacts would not occur. The primary hunting impact would be a loss of sage grouse caused by disturbance of strutting and nesting habitat. Other hunting pursuits would not be appreciably affected.

Alternative 1, Development: All of the impacts described above would occur.

Alternative 2, No Action (Existing Oil and Gas Categories): The existing stipulations provide some measure of protection to 1,720 acres of sage grouse habitat. The resulting hunting impacts would be reduced with these seasonal restrictions because bird populations would be maintained.

Alternative 3, Multiple Use (Preferred Alternative): With the additional 640 acres placed under categories 2 and 3 (a total of 2,360 acres), significant impacts to the sage grouse population would not be expected.

Alternative 4, Restricted Development: With no surface occupancy on 2,360 acres, there would be no appreciable impacts to hunting because the sage grouse populations would be maintained.

LAND USES AND LAND USE PLANS: Existing rights-of-way and public roads could be severely impacted by tar sand development. Surface mining would obliterate roads, pipelines, and communication sites in the mining process. In-situ development could avoid physical disturbance to such rights-of-way. Any development of tar sand would require many additional rights-of-way. Reconstruction of existing roads and pipelines could be required, and communication sites would have to be moved to other locations.

Alternative 1, Development: This alternative would have the highest potential for conflict with existing rights-of-way. All impacts described above could occur.

Alternative 2, No Action: This alternative would have similar impacts to Alternative 1.

Alternative 3, Multiple Use (Preferred Alternative): This alternative would have impacts similar to Alternative 1. Seasonal restrictions would not protect existing roads, communication sites, etc.

Alternative 4, Restricted Development: Impacts would be similar to Alternative 1 except for 2,560 acres which would be placed under no surface occupancy stipulations.

SOCIOECONOMICS: Most of the construction required by tar sand development in the STSA could be absorbed by the existing labor force in Uintah and

Duchesne Counties, assuming no other major projects were under development at the same time. However, depending on the skills needed in construction, a number of workers would still come from outside the Uinta Basin. Because of its proximity to the project, Ashley Valley would receive the majority of impacts. There is currently sufficient housing to accommodate construction workers that might come from outside the area. If, however, other projects were being developed simultaneously, there could be a shortage of adequate housing for some transient workers. The major public facilities and services in Ashley Valley can or soon will be able to accommodate a limited population increase. Some enlargement of these existing facilities could be required, depending on the activity of other projects.

Impacts to communities on the west side of Uintah County and in Duchesne County would probably be less than those anticipated for Ashley Valley. It is expected that they would also be able to absorb a limited increase in population.

Utah Senate Bill 170 allows developers to mitigate fiscal impacts through sales and property tax prepayments. Both Uintah and Duchesne counties' zoning regulations require county approval of a development before permits are given to proceed with construction. The counties would, therefore, have some control over the developer's mitigation of any present or anticipated local socioeconomic impacts at the time construction began. However, this is not true for the Uintah and Ouray Indian Reservation, because this area is not covered by the provisions in Utah Senate Bill 170. Therefore, the reservation would not be covered by any mitigation agreed to by either Uintah or Duchesne counties under Senate Bill 170.

The loss of forage from surface activities would have some economic impact to ranchers presently using the area. Development of tar sand would also displace some of the STSA's existing recreation use.

In the past, residents of Uintah and Duchesne Counties have accepted energy development, and it is anticipated that development of tar sand would not change these attitudes.

Alternative 1, Development, and Alternative 2, No Action: All of the above-mentioned impacts would occur.

Alternative 3, Multiple Use (Preferred Alternative): The related socioeconomic effects would be slightly less than those occurring under Alternatives 1 or 2 because of the additional 2,560 acres placed in a more restrictive category. This would restrict development, thereby reducing the required work force. However, the exact differences in impacts cannot be determined with available data.

Alternative 4, Restricted Development: Because 19 percent of the STSA would be in a more restrictive leasing category (3), impacts to nearby communities would be less severe. The expected reduction in hydrocarbon development would reduce the required work force to a greater extent than Alternatives 1, 2, or 3; however, the exact difference cannot be determined at this time with available data.

Pariette STSA

MAJOR ISSUES

The Pariette tar sand deposits (22,071 acres) are located in eastern Duchesne and western Uintah counties, northeastern Utah. A portion (approximately 8,000 acres) of this STSA is located in the Uintah and Ouray Indian Reservation and will not be included in this category amendment. An additional 1,759 acres are in State and private ownership, leaving a total of 12,312 acres administered by the BLM.

The following issues have been identified for the oil and gas and tar sand development and production within the Pariette STSA.

- **Watershed:** The STSA contains public lands defined as wetlands (Executive Order 11990, May 24, 1977) or floodplains (Executive Order 11988, May 24, 1977) which have special value, including waterfowl habitat. There are also Federal lands containing important live water which require special protection. Water is scarce in the STSA, and full tar sand development could interrupt water flow.
- **Wildlife--Threatened, Endangered or Sensitive Animal Species:** Within the Pariette STSA, golden eagle roost and bald and golden eagle concentration areas on Federal lands are used during migration and wintering periods. These areas could require special protection if oil and gas or tar sand development occurred. This area includes a portion of the Pariette Waterfowl Management Area, Township 8 South, Range 18 East, Sec. 34, which lies upstream from a flood control structure. The area provides limited waterfowl and raptor nesting habitat and, most important, serves as an important raptor foraging area. The birds concentrate here largely because of the numbers of small rodents and cottontail rabbits that using Pariette Draw. The birds use this area in the winter, but particularly heavy use occurs during the golden eagle nesting season, usually between February 15 and June 15.
- **Wildlife--Sensitive Animal Species:** There is a golden eagle nest site on Federal lands adjacent to the STSA that has been active for the last 3 years. Protection and an adequate buffer zone for the nest site might not be possible with certain types of surface activity associated with oil and gas and tar sand development.
- **Threatened or Endangered Plant Species:** Small scattered populations of Uinta Basin hookless cactus, *Sclerocactus glaucus*, occur on dry gravelly soils on hills and benches near Pariette Draw. The existing environment provides good habitat, and several occurrences have been documented. The occurrence of these plants would conflict with oil and gas and tar sand development.

ALTERNATIVES

Alternative 1, Development

All Federal acreage administered by BLM within the STSA (12,312 acres) would be category 1, open to leasing

(see Figure 2-25). This alternative would maximize the area available for oil and gas and tar sand development throughout the STSA.

Alternative 2, No Action (Existing Oil and Gas Categories)

Both competitive CHLs and converted leases would be subject to the oil and gas category system established in 1975, and BLM would maintain the existing categories. The following lists the categories and approximate acres and percent of area for each. (Figure 2-26 shows locations of proposed categories.)

Category	Acres	Percent
1	7,112	58
2	5,200	42

Waterfowl Habitat (Category 2, 5,200 Acres). A 1975 EA characterized the following described lands as important waterfowl habitat. These lands were placed in category 2:

Township 8 South, Range 17 East, Sec. 24: Lot 1, E $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 25: E $\frac{1}{2}$ E $\frac{1}{2}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$; Sec. 26: S $\frac{1}{2}$ S $\frac{1}{2}$; Sec. 27-28: All; Sec. 33: All; Sec. 34: NW $\frac{1}{4}$.

Township 8 South, Range 18 East, Sec. 27-30: All; Sec. 34: E $\frac{1}{2}$ NE $\frac{1}{4}$.

Stipulation:

- No occupancy or other surface disturbance will be allowed within 600 feet of live water. This distance may be modified when specifically approved in writing by the authorized officer of the Federal surface management agency.

Alternative 3, Multiple Use (Preferred Alternative)

This alternative utilizes new resource data and considers the overall value of both renewable and mineral resources. The following lists the categories and approximate acres and percent of area for each. (Figure 2-27 shows locations of proposed categories.)

Category	Acres	Percent
1	8,479	69
2	3,833	31

The following discusses the issues previously identified and lists their respective areas of concern:

Watershed (Category 2, 80 Acres). Those public lands defined as wetlands or floodplains in Pariette Draw are included in the Pariette Waterfowl Management Area. The area provides waterfowl and limited raptor nesting. It also provides important raptor prey base. Protection of this area is consistent with the provision of Executive Orders 11990, (May 24, 1977) or 11933 (May 24, 1977). The area is defined as:

Township 8 South, Range 18 East, Sec. 34: E $\frac{1}{2}$ NE $\frac{1}{4}$.

Stipulation:

- No occupancy or other surface disturbance will be allowed within 600 feet of wetland and floodplain environments. This distance may be modified when specifically approved in writing by the authorized officer of the Federal surface management agency.

Watershed (Category 2, 40 Acres). BLM has a water filing on a well for livestock and wildlife use. Because of the sparse

PARIETTE STSA

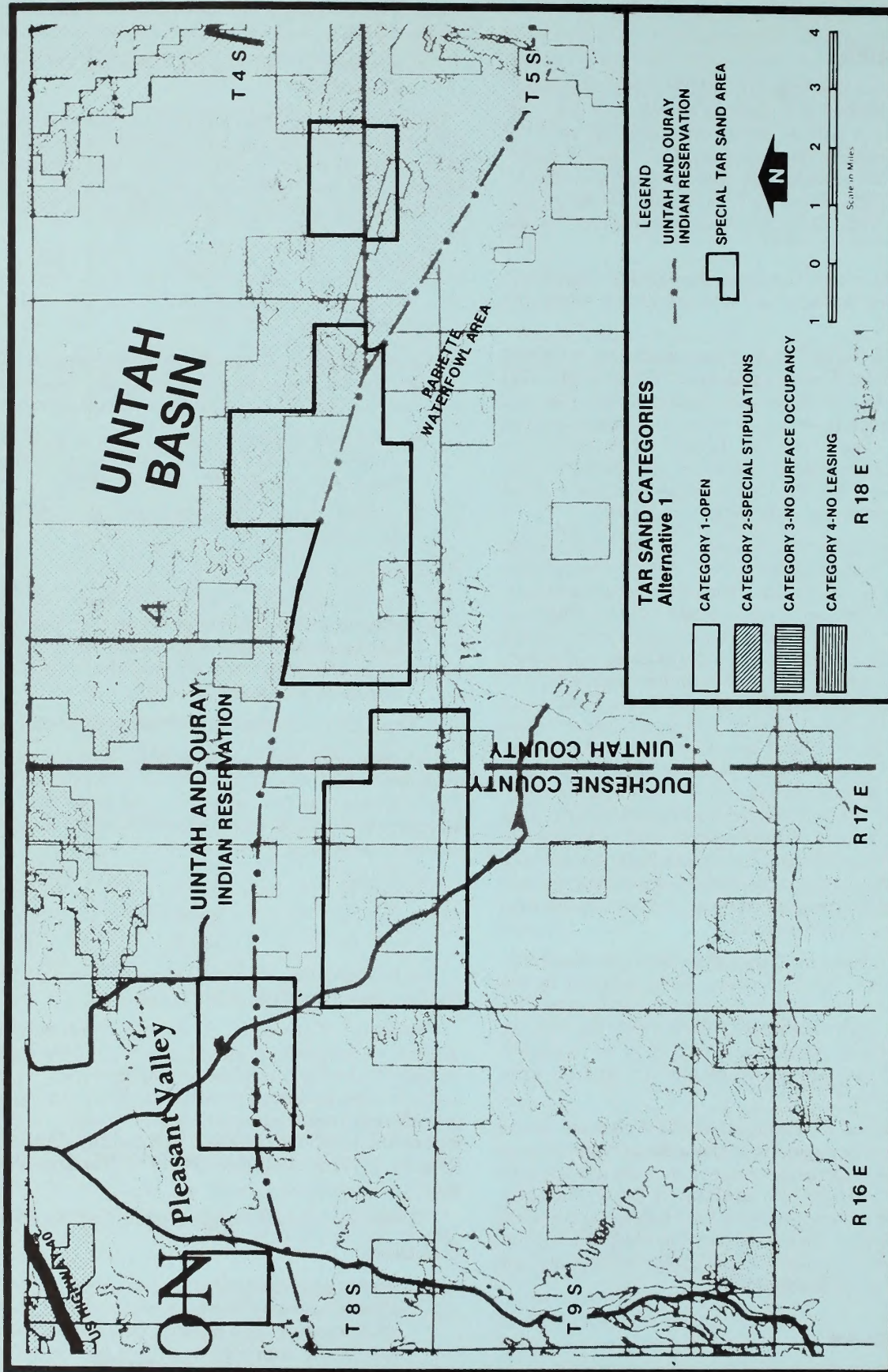


FIGURE 2-25
ALTERNATIVE 1, PARIETTE STSA

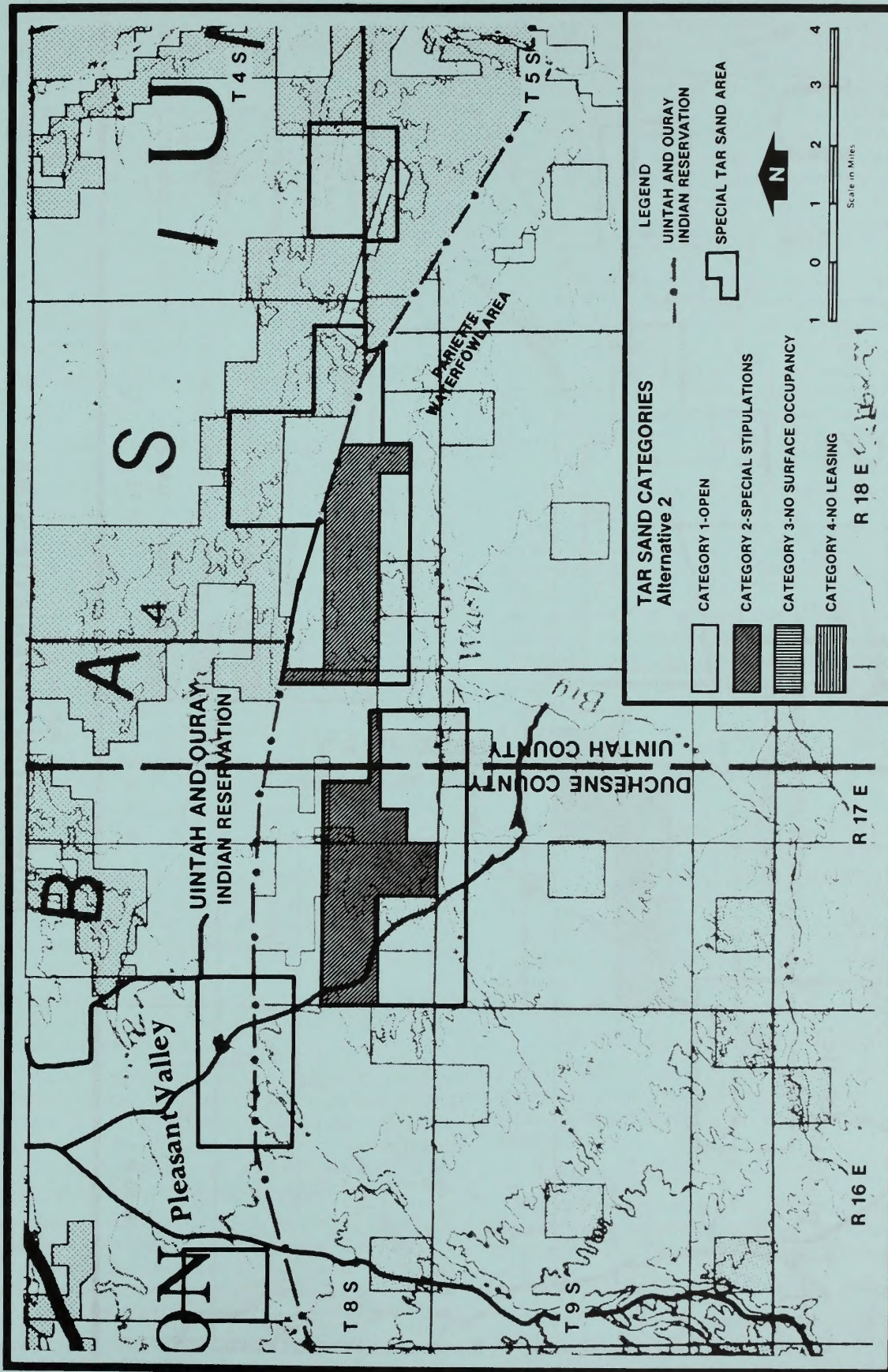


FIGURE 2-26

ALTERNATIVE 2, PARIETTE STSA

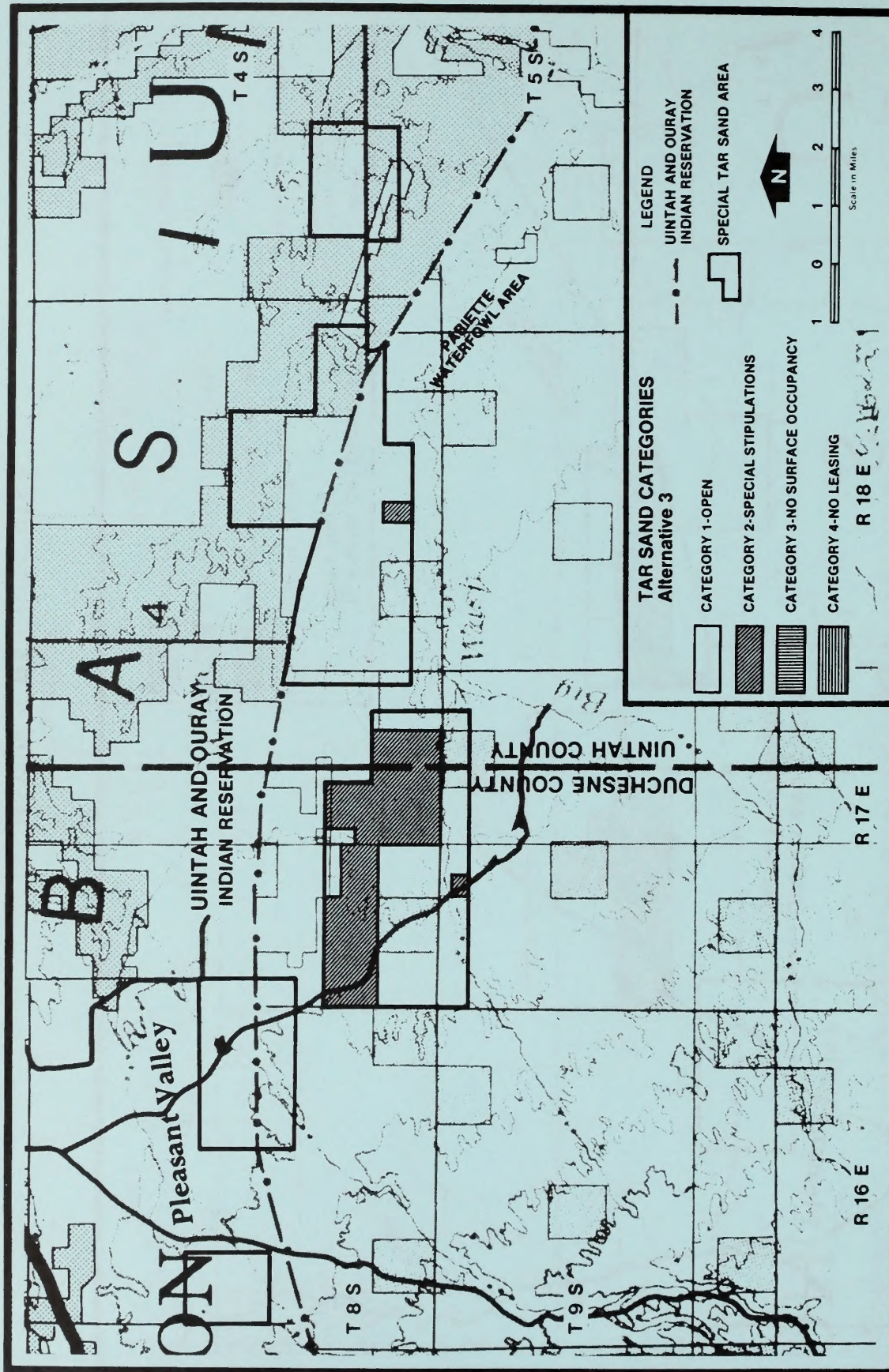


FIGURE 2-27
ALTERNATIVE 3, PARIETTE STSA

PARIETTE STSA

water supplies in this area, this water should be protected. The well is located in:

Township 9 South, Range 17 East, Sec. 4: SW $\frac{1}{4}$ NW $\frac{1}{4}$.

Stipulation:

- No occupancy or other surface disturbance will be allowed within 600 feet of live water. This distance may be modified when specifically approved in writing by the authorized officer of the Federal surface management agency.

Wildlife--Threatened, Endangered or Sensitive Animal Species (Category 2, 80 Acres). Bald and golden eagles concentrate in the wetland areas of Pariette Draw where they prey on rodents and rabbits, particularly during the golden eagle nesting period (February 15 to June 15). This area is described as follows:

Township 8 South, Range 18 East, Sec. 34: E $\frac{1}{2}$ NE $\frac{1}{4}$.

Stipulations:

- To protect seasonal wildlife habitat, surface-disturbing activities will be allowed only from June 15 to November 1. This does not apply to maintenance and operation of producing wells and facilities.
- Oil and gas resources may be extracted by conventional methods only, no in-situ or surface-mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of the Federal surface management agency.

Wildlife--Sensitive Animal Species (Category 2, 80 Acres). There is a golden eagle nest site on public lands adjacent to the STSA that has been active at least once in the last 3 years. This site and an adequate buffer zone require special protection and are located in:

Township 8 South, Range 18 East, Sec. 34: E $\frac{1}{2}$ NE $\frac{1}{4}$.

Stipulations:

- To protect seasonal wildlife habitat, surface-disturbing activities will only be allowed during periods from June 15 to February 15. This does not apply to maintenance and operation of producing wells and facilities.
- Access roads will be placed no closer than 0.25 mile of an active nest or a nest known to be active in one of the previous 3 years.
- Oil and gas resources may be extracted by conventional methods only, no in-situ or surface mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the authorized officer of the Federal surface management agency.

Threatened or Endangered Plants Species (Category 2, 3,713 Acres). Uinta Basin hookless cactus, *Sclerocactus glaucus*, inhabits dry gravelly soils on hills and benches in the STSA. Several populations have been documented within the area described below:

Township 8 South, Range 17 East, Sec. 26: S $\frac{1}{2}$ S $\frac{1}{2}$; Sec. 27: E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$; Sec. 28: S $\frac{1}{2}$ N $\frac{1}{2}$, S $\frac{1}{2}$; Sec. 29: All; Sec. 30: Lots 1-14, N $\frac{1}{2}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 34: All; Sec. 35: All.

Stipulations:

- The Federal surface management agency will assure that the area to be disturbed is examined prior to undertaking any surface-disturbing activities on lands covered by this lease. This examination will determine effects on any plant or animal species listed or proposed for listing as endangered or threatened or their habitats. If the findings of this examination determine that the operation may detrimentally affect an endangered or threatened species, some restrictions to the operator's plan of operation or disallowances of use may result.
- The lessee/operator may, at his discretion and cost, conduct the examination on the lands to be disturbed. This examination must be done by or under the supervision of a qualified resource specialist approved by the surface management agency. An acceptable report must be provided to the surface management agency identifying the anticipated effects of the proposed action on threatened or endangered species or their habitat.

Alternative 4, Restricted Development

The protection alternative is similar in scope to the other alternatives, but would ultimately place more emphasis on protecting the renewable resource values and the existing surface environment. This alternative again considers each issue, but an even greater level of protection is recommended through more restrictive stipulations. The following lists the categories and approximate acres and percent of area for each. (Figure 2-28 shows locations of proposed categories.)

Category	Acres	Percent
1	8,479	69
3	3,833	31

Watershed (Category 3, 80 Acres). The wetlands and floodplains (identified in Alternative 3) which provide prey for raptors and waterfowl habitat would be placed in category 3 (no surface occupancy):

Township 8 South, Range 18 East, Sec. 34: E $\frac{1}{2}$ NE $\frac{1}{4}$.

Watershed (Category 3, 40 Acres). The area surrounding the water well (discussed in Alternative 3) would be placed in category 3 (no surface occupancy):

Township 9 South, Range 17 East, Sec. 4: SW $\frac{1}{4}$ NW $\frac{1}{4}$.

Wildlife--Endangered or Sensitive Animal Species (Category 3, 80 Acres). The area where bald and golden eagles concentrate in Pariette Draw would be closed to surface disturbance:

Township 8 South, Range 18 East, Sec. 34: E $\frac{1}{2}$ NE $\frac{1}{4}$.

Wildlife--Sensitive Animal Species (Category 3, 80 Acres). The active golden eagle nest site located in Pariette Draw would be closed to surface disturbance:

Township 8 South, Range 18 East, Sec. 34: E $\frac{1}{2}$ NE $\frac{1}{4}$.

Threatened and Endangered Plant Species (Category 3, 3,713 Acres). The areas where the threatened and endangered Uinta Basin hookless cactus, *Sclerocactus glaucus*, is located would be closed to surface disturbance.

Township 8 South, Range 17 East, Sec. 26: S $\frac{1}{2}$ S $\frac{1}{2}$; Sec. 27: E $\frac{1}{2}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$; Sec. 28: S $\frac{1}{2}$ N $\frac{1}{2}$, S $\frac{1}{2}$; Sec. 29: All; Sec. 30: Lots 1-14, N $\frac{1}{2}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 34: All; Sec. 35: All.

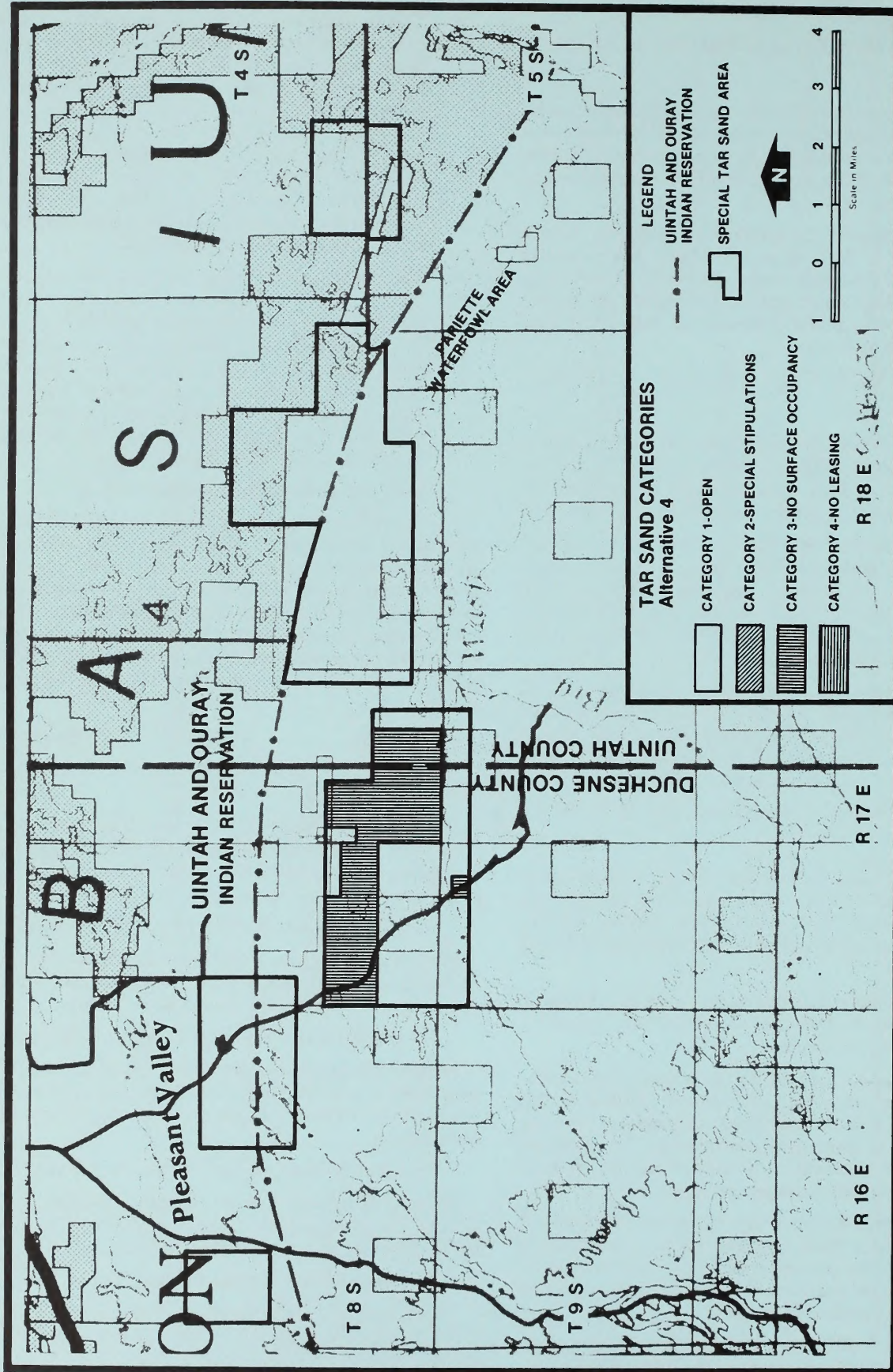


FIGURE 2-28

ALTERNATIVE 4, PARIETTE STSA

AFFECTED ENVIRONMENT

Geology and Topography

The Utah Uinta formation overlies the Green River formation and contains tar sand or petroleum impregnations in sandstones. These sandstone beds are lenticular (Covington, 1964). The bituminous-impregnated sandstones of the Uinta formation are probably stream deposits (Hunt, Stewart, and Dickey, 1954) (see Figure 2-29). The thickness of the Uinta Formation has not been measured, but a contour map and cross-section and observations in gilsonite mine shafts suggest that the Uinta formation may be 1,500 feet or more thick.

The regional slope of the surface is north and northeast toward the axis of the Uinta Basin. Although published data are lacking on the structure of the area, the strata probably dip 1°-3° north to northeast. The Duchesne-Myton east-west fault zone passes through the western part of the deposits. According to Covington (1964), the deposits are all located updip from the faults. He believes the source of the oil was beds in the lacustrine Green River formation. The oil moved updip from fractured shale reservoirs in the Green River and up the faults to enter sandstones of the Uinta formation. The faults in the Duchesne-Myton fault zone are described as tensional faults with as much as several hundred feet displacement (Porter, 1963).

The ground surface in the area varies from dissected benches of moderate relief to gently sloping flats of low relief. The maximum local relief on the benches is about 350 feet, although in most places the relief is not more than 100 feet. Erosion of the benches has left numerous small buttes and steep escarpments. Elevations in the vicinity of the deposits range from about 4,800 to 5,400 feet. The deposits apparently are confined for the most part to Leland Bench and Pariette Bench, north of Pariette Draw and Castle Peak Draw. Drainage flows are predominantly eastward through these draws, which discharge into the Green River.

Air Quality and Climate

The STSA is within a Class II air quality designation. This designation allows for moderate deterioration normally accompanying well-controlled growth. Dinosaur National Monument, 40 miles to the northeast, has been recommended for Class I designation. No major air pollution sources have been identified in the vicinity of the Pariette STSA.

Annual precipitation at Pariette ranges from 6 to 8 inches. Temperatures range from -31°F in winter to 102°F in summer. The June-September frost-free season averages approximately 120 days.

Soils

Major soils in this unit are Motto, Muff and Uffens, which make up about 70 percent of the area. The remaining 30 percent includes badland, rock outcrop, and minor soils. This area is mainly rolling hills, alluvial fans, benches, and terraces on slopes ranging from 2 to 25 percent, with the majority ranging between 2 and 8 percent.

Motto soils are shallow and well drained with a very gravelly sandy loam surface layer and a clay loam underlying layer resting on hard shale at a depth of about 19 inches. Muff soils are moderately deep and well drained, with a gravelly sandy loam surface layer. Underlying layers are sandy clay loam or clay loam. Sandstone occurs at a depth

of about 29 inches. Uffens soils are very deep and well drained with a gravelly sandy loam surface layer. The underlying layer is clay loam to a depth of 60 inches or more.

Most of the area is alkali affected, and has a desert pavement covering formed by sheet erosion. Soil productivity of the area is generally very low. Reclamation potential is poor on the shallow soils and poor to fair on the deeper soils because of low rainfall and alkali-affected soils.

Vegetation

Two vegetation communities exist within this STSA. The alkaline riparian community, restricted to floodplains and intermittent stream channels, comprises a small percentage of the total vegetation. Greasewood, tamarisk, and rabbitbrush are the predominant vegetation types found here.

The most dominant vegetation community consists of low-desert shrubs, warm- and cool-season grasses, and numerous forb species. Shrub species include black sagebrush, horsebrush, shadscale, budsage, Wyoming sagebrush, rabbitbrush species, and hopsage. Galleta grass (curly grass), bottlebrush, squirreltail grass, needle-and-thread grass, Indian ricegrass, cheatgrass, and six-week fescue are the most dominant grasses.

This STSA includes habitat and known populations of the Federally listed threatened plant species *Sclerocactus glaucus* (Uinta Basin hookless cactus). Habitat for the cactus consists of the shallow, gravelly soils 20-30 feet below bench rims having an east or south aspect. No other threatened and endangered plant species are known to exist within this STSA.

Livestock Grazing and Agriculture

There are eight permittees who graze sheep and cattle (665 AUMs) on six allotments which partially overlap this STSA. Table 2-17 contains data on livestock grazing for the STSA. There are no lands in agricultural production within the STSA.

Water Resources

No seeps or springs are known to occur within the STSA. BLM has a water filing on a well in Township 9 South, Range 17 East, Sec. 4, SW¼NW¼, (47-1330). No water quality or quantity information is available. The water is not currently being used for livestock, but is considered important because of the scarcity of water in the STSA.

Groundwater in the STSA is found in shallow consolidated and unconsolidated geologic deposits. Local and areawide water flow direction and properties of the aquifers are not known.

Wells Draw and Castle Peak Draw are intermittent streams, flowing only during periods of snowmelt and after intense thunderstorms. Pariette Draw has a perennial stream, averaging 25 cubic feet per second (cfs) at the gauge located in Township 8 South, Range 18 East, Sec. 27. Much of the water is irrigation return flow from Pleasant Valley and is described as being slightly saline (TDS averaged 2,560 mg/l [milligrams per liter] from 1976 to 1981). State water quality standards for boron are regularly exceeded in Pariette Draw.

Minerals

TAR SAND: The Pariette tar sand deposits are scattered over an area about 20 miles east-west by 4 miles north-south. The center of the deposits is about 8 miles

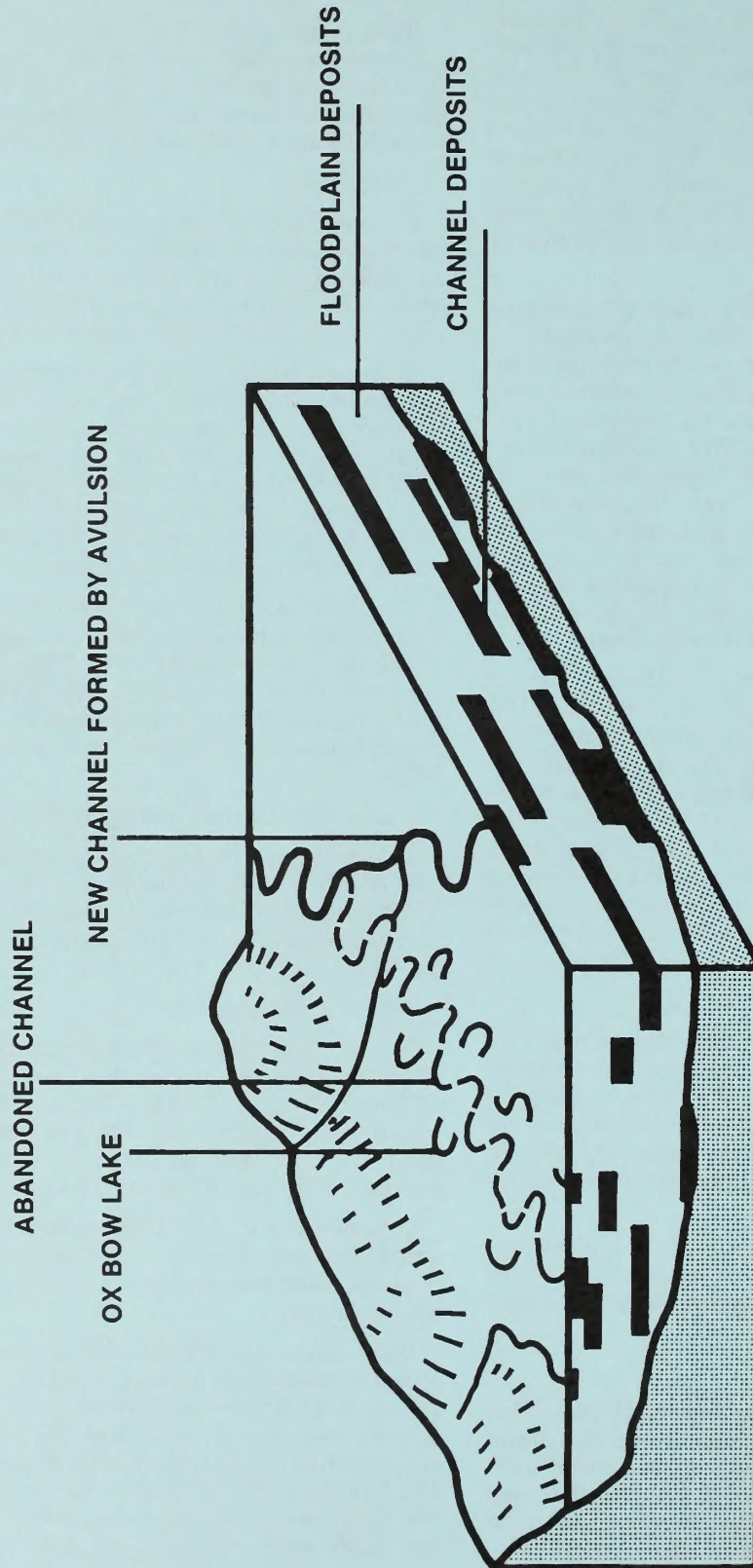


FIGURE 2-29
DIAGRAM SHOWING CHANNEL DEPOSITS
OF A RIVER SYSTEM

PARIETTE STSA

TABLE 2-17

Livestock Grazing Data for Pariette STSA

Allotment	Class of Livestock	Season of Use	Federal AUMs Within the STSA	Percent of Allotment Within STSA
Antelope Powers	Sheep	11/1-4/15	16	1
Wells Draw	Sheep	11/1-4/15	197	9
Snyder Springs- Step Ant	Cattle	11/16-4/15	247	6
Hungry Hollow	Cattle	11/16-4/15	93	5
Eight Mile Flat	Cattle	11/16-4/15	74	7
Wetlands	Cattle	5/16-2/15	28	3

Source: USDI, BLM, 1983b.

southeast of the town of Myton, 23 miles east-southeast of Duchesne, and 15 miles south of Roosevelt. U.S. Highway 40 passes through the towns of Duchesne, Myton, and Roosevelt, and the deposits are accessible via State Highway 53 and 216 and numerous seasonal roads.

The lack of site-specific information on the individual deposits and their possible subsurface extent precludes any consideration of mining methods. The relatively small apparent size and discontinuity of the deposits suggests that they would not be amenable to any large-scale operation. Covington (1964) does not believe the deposits are of commercial value because of the highly lenticular nature of the sandstones and the fairly lean quality of the beds. It is assumed that, if any development would occur, it would be by in-situ methods.

GILSONITE: Gilsonite veins were identified as sub-economic deposits because of the small amount of gilsonite remaining in the mined veins, the narrow widths, and the competition from the deposits in the Bonanza area. Also, the present leasing moratorium and the lack of a suitable mining technology for narrow veins prevent these deposits from being developed.

OIL SHALE: Oil shale deposits within this unit are considered subeconomic because of extensive overburden, high value for oil and gas, and richer, thicker deposits to the east. No development of oil shale is expected in the foreseeable future.

OIL AND GAS: The Pariette area has a demonstrated potential for oil and gas recovery. Wells in and near the area are spaced at one hole per 40 acres. Nearly all wells produce some oil. A portion of the STSA lies within a KGS for oil and gas. The KGS includes two unitized areas for oil and gas. The entire STSA is chiefly valuable for oil and gas.

SALEABLE MINERALS: Sand and gravel deposits in the unit occur chiefly on pediments and old river terraces. The landforms include dissected, gravel-capped knolls, ridges, and benches. At present, no exploration, development, or production of sand and gravel is occurring except for material being removed by Duchesne County for road maintenance.

LOCATABLE MINERALS: Uranium and copper deposits have been classified as subeconomic because of the overall low grade of the ore bodies and economic problems associated with mining and transportation.

Wildlife

BIG GAME: Ten to 15 deer utilize the Pariette STSA on a yearlong basis. They are found primarily in the brushy vegetation along Pariette Wash. Antelope are also present on the STSA, particularly on Pariette Bench and Eight Mile Flat. In the past 2 years, five antelope permits have been issued by UDWR for the Myton Bench herd unit. This herd unit includes only a small portion of the STSA.

UPLAND GAME: Cottontail rabbits are found throughout the STSA, particularly along Pariette Wash and on rocky sidehills. Mourning doves are distributed throughout the STSA during the summer months. California quail and ring-necked pheasants are common in the agricultural fields near the west side of the STSA.

NON-GAME SPECIES: A variety of non-game species, including coyotes, white-tailed prairie dogs, and black-tailed jackrabbits, are present in the STSA. Marsh

hawks, red-tailed hawks, ferruginous hawks, prairie falcons, and American kestrels are common throughout the STSA and all nest in the area. Rough-legged hawks and merlins are uncommon visitors to the STSA, particularly during the winter months.

MIGRATORY WILDLIFE : The Pariette Waterfowl Management Area lies directly southeast of the STSA. The area encompasses approximately 3,000 acres of waterfowl nesting, brooding, and feeding habitat. Water is supplied to the area by Pariette Draw, which runs directly through the STSA before entering the waterfowl area. The wetland provides nesting habitat for 300 to 500 pairs of ducks annually, as well as 4 to 8 pairs of Canadian geese. Other non-game species of wildlife nest in the area as well, including eared grebes, red-winged blackbirds, American coots, snowy egrets, and American avocets. Raccoons, striped skunks, and bull snakes are common nest predators in the wetland area.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES: The bald eagle, an endangered species, is a uncommon winter visitor to the area. The golden eagle, a sensitive species afforded the same protection under the Eagle Protection Act, nests adjacent to the STSA. The presence of white-tailed prairie dogs in the STSA may indicate the presence of black-footed ferrets. However, confirmed sightings of this species have not been made.

Visual Resources

Scenery is rated as C (low). Sensitivity is considered low, which resulted in a VRM class rating of IV. Colors are muted-tan soils with a grey-green sagebrush vegetative overstory.

Cultural Resources

This area contains few sites. Overall site density equals 0.87 per square mile. Additional work by BLM personnel has indicated that sites in this area are normally located on sand dunes, cobble fields, and elevated rock monoliths. The following types of sites are present: (1) lithic scatters; (2) quarries; (3) camps; (4) rock art; (5) burials; (6) special activity sites; and (7) randomly located hearths.

Recreation

Limited hunting opportunities for waterfowl, deer, antelope and rabbits exist. There are also opportunities for viewing waterfowl, primarily in the spring. ORV use is limited to designated roads and trails. Currently, no developed recreation sites exist.

Land Uses and Land Use Plans

The major land uses in the STSA include livestock grazing and oil and gas development. A county road from Myton bisects the western portion of the STSA. The Diamond Mountain Area MFP was completed in 1983.

Wilderness

No WSAs have been designated within this STSA.

Socioeconomics

Refer to the Socioeconomics section of Asphalt Ridge STSA.

ENVIRONMENTAL CONSEQUENCES

As discussed in the Minerals section above, the tar sand deposit in this area is relatively small and uneconomic for

any large-scale operation. There is an apparent lack of interest in developing this area for tar sand. Consequently, impacts expected to the following resources, are few and will not require further analysis. These include air quality; geology and topography; soils; livestock grazing; visual, cultural resources; recreation; and other land uses.

Oil and Gas and Tar Sand Resources

The STSA includes KGSs producing oil and gas. It includes two oil and gas units, and there is demonstrated oil and gas production. Little information is available concerning the tar sand resource, but there is some potential for in-situ recovery.

ALTERNATIVE 1, DEVELOPMENT: Open leasing would provide for maximum development of oil and gas and tar sand.

ALTERNATIVE 2, NO ACTION (EXISTING OIL AND GAS CATEGORIES): Under the existing categorization system, the only area of concern was the wetlands. These areas are small enough to provide protection and still permit a conventional recovery program. The stipulation for wetlands restricts surface intensive development such as surface mining, although the potential for this type of development is low. When considering impacts on the environment, in-situ technology for tar sand would be less than conventional and surface mining; however, tar sand development would be allowed.

ALTERNATIVE 3, MULTIPLE USE (PREFERRED ALTERNATIVE): The amount of development would be more restricted because more emphasis has been placed on watershed, wildlife, and threatened and endangered species. Because of the small amount of surface disturbance required, conventional oil and gas recovery could still be allowed; however, any surface intensive recovery of tar sand might be impossible. Because of the lack of data on the tar sand deposit and the lack of interest by industry, the area is considered to have low potential for tar sand extraction. Therefore, protection of renewable resources would not unreasonably interfere with current development of mineral resources.

ALTERNATIVE 4, RESTRICTED DEVELOPMENT: No surface occupancy would provide the maximum protection to special resource values, but could unreasonably interfere with recovery of oil and gas and eliminate recovery of tar sand. In many instances, directional drilling would be possible, but such drilling is expensive and could be uneconomical.

Other Minerals

The oil shale is too deep to be considered economically recoverable, and no locatable minerals of significance have been identified. Until oil shale withdrawal is revoked, the area will remain closed to exploitation development under the general mining laws. Thus, there would be few, if any, expected impacts to other mineral values from any alternative under consideration.

Other Resource Values

WATER RESOURCES (WETLANDS AND FLOODPLAINS): Impacts to wetlands and floodplains from oil and gas and tar sand development along Pariette Draw could result in surface disturbance and contamination of surface water and groundwater. If wetlands and floodplain areas were surface mined, wetlands could be drained and floodplains damaged.

Surface mining probably would not impact any deep groundwater aquifer; however, small shallow alluvial aquifers could be lost because of tar sand and overburden removal. In-situ mining could impact aquifers through injection of solvents and steam or burning, which would affect groundwater quality in the tar sand zone. Aquifer flows could change or dry up because of subsidence.

Alternative 1, Development: All of the above-mentioned impacts could occur.

Alternative 2, No Action (Existing Oil and Gas Categories): Under the existing category system, the stipulation to allow no surface occupancy or disturbance within 600 feet of live water would be generally adequate to protect wetlands, floodplains, and waterfowl habitat from the impacts discussed above. Under this alternative, the stipulation would apply to both oil and gas and tar sand development.

Alternative 3, Multiple Use (Preferred Alternative): Impacts would be similar to Alternative 2. However, an additional 40 acres would be placed in category 2 to protect a water well for livestock and wildlife use.

Alternative 4, Restricted Development: This alternative would provide the maximum amount of protection to wetlands and floodplains through a no surface occupancy stipulation. An 80-acre area would be subject to the no surface occupancy stipulation rather than allowing development 600 feet from live water. An additional 40 acres would be placed in category 3 to protect a water well for livestock and wildlife use.

WILDLIFE--BALD OR GOLDEN EAGLES: Oil and gas or tar sand development could result in disturbance or displacement of wintering bald and golden eagles by mining activities as well as increased human harassment. Also, surface mining of tar sand could destroy roosting and prey habitat; however, before any hydrocarbon development could occur, consultation with the FWS would be initiated under any alternative.

Alternative 1, Development: Open development with general stipulations could result in all the impacts discussed above. This alternative would maximize energy exploration and production at the expense of roosting and feeding requirements for bald or golden eagles.

Alternative 2, No Action (Existing Oil and Gas Categories): Impacts would be the same as Alternative 1 because no special stipulation presently exists for eagle roosting or concentration areas.

Alternative 3, Multiple Use (Preferred Alternative): This alternative would allow oil and gas exploration and production but would restrict exploration and production of other types of hydrocarbons. Oil and gas exploration and development activities would be authorized only when eagles were not using the area. Also, heavy development, including activities necessary for surface mining or in-situ recovery, would not be allowed. Thus, no impacts from such development would occur.

Alternative 4, Restricted Development: This alternative would provide for total resource protection from all hydrocarbon development because the entire area would be closed to surface occupancy.

WILDLIFE--GOLDEN EAGLE NEST SITE: Any hydrocarbon development could result in the loss of hunting territories for adult and juvenile golden eagles and

CHAP 2: ALTERNATIVE EVALUATIONS

could result in the abandonment of nest sites because of mining activities and human harassment. However, eagles are protected under the Eagle Protection Act of 1969; also, consultation with FWS would be necessary before any tar sand development could occur. This consultation would be required under any alternative.

Alternative 1, Development: All of the impacts described above could occur.

Alternative 2, No Action: Impacts would be the same as Alternative 1.

Alternative 3, Multiple Use (Preferred Alternative): This alternative would allow oil and gas exploration and production, but would restrict removal of other hydrocarbons. Oil and gas activities would be authorized only when golden eagle nest sites would not be adversely affected. Surface mining and in-situ development and production of tar sand would not be allowed. Thus, no impacts would occur from tar sand development.

Alternative 4, Restricted Development: This alternative would provide protection for golden eagle habitat because the entire area would be closed to surface occupancy. Development of any oil and gas resource would have to occur outside the STSA.

WILDLIFE--MIGRATORY WATERFOWL:

Hydrocarbon development could cause a disruption of downstream flows, resulting in a loss of water to the Pariette Waterfowl Management Area and a loss of brooding and nesting habitat. Sedimentation could also be increased, resulting in a greater accumulation of silt behind the flood control and desilting structures. The end result could be a net loss in the effectiveness of the structures and a need to build additional structures to control water levels during periods of high runoff.

Alternative 1, Development: All of the impacts listed above could occur.

Alternative 2, No Action: The Pariette Waterfowl Management Area is currently included in a no surface occupancy category under the existing 1975 oil and gas categories. The existing stipulations within the STSA do not allow surface occupancy within 600 feet of live water. Thus, the waterfowl habitat would be protected.

Alternative 3, Multiple Use (Preferred Alternative): This alternative would allow oil and gas exploration and production, but would restrict removal of other hydrocarbons on that portion of the STSA included in the Pariette Waterfowl Management Area (Township 8 South, Range 18 East, Sec. 34: E $\frac{1}{2}$ NE $\frac{1}{4}$). Oil and gas activities would be authorized only when disturbance of breeding or nesting birds would be minimal. Surface mining and in-situ development and production of tar sand would be restricted.

Alternative 4, Restricted Development: This alternative would provide protection for nesting waterfowl and would assure continued downstream flows. Therefore, there would be no increase in sedimentation because the area would be closed to surface occupancy. Development of oil and gas resources would have to occur outside the STSA.

VEGETATION (THREATENED OR ENDANGERED PLANT SPECIES):

Surface-disturbing activities associated with oil and gas or tar sand development include well site preparation; construction of access roads, exploration roads, and drill holes; and upgrading of plant

complexes and supporting facilities. All of these actions require removal of vegetation and topsoil. Surface mining would cause the greatest impacts, with complete removal of vegetation and overburden material. Construction activities could destroy existing populations and potential habitat of the threatened Uinta Basin hookless cactus *Sclerocactus glaucus*. However, this species is protected by statute under the Threatened and Endangered Species Act of 1969, and consultation with FWS would be necessary under any alternative before hydrocarbon development could occur.

Alternative 1, Development: All of the above-mentioned impacts could occur.

Alternative 2, No Action (Existing Oil and Gas Categories): This alternative would result in the same impacts as Alternative 1.

Alternative 3, Multiple Use (Preferred Alternative): If the Uinta Basin hookless cactus were found on any site proposed for disturbance, the site could be moved or the plant populations would be relocated.

Alternative 4, Restricted Development: No surface occupancy would be allowed in the areas described above. This would preclude adverse impacts to threatened and endangered plants and potential habitats. Development of any oil and gas resource would not be allowed on habitat for these species.

SOCIOECONOMICS: Western Uintah County and eastern Duchesne County are the areas that would be most heavily impacted by development of the STSA. The area is adjacent to the Uintah and Ouray Indian Reservation and any activity would impact tribal people and lands. With the possible exception of Roosevelt, the communities nearest the STSA are small and probably among the least prepared to deal with growth resulting from tar sand development. In many cases, basic services such as sewer and water systems, fire and police protection, schools, and hospitals could not accommodate the expected increases in populations.

Utah Senate Bill 170 allows developers to mitigate fiscal impacts through sales and property tax prepayments. Both Uintah and Duchesne counties' zoning regulations require county approval of a development before it is given permits to proceed with construction. The counties would, therefore, have some control over the developer's mitigation of any local socioeconomic impacts present or anticipated at the time construction began. However, this is not true for the Uintah and Ouray Indian Reservation. It is not covered by the provisions of Utah Senate Bill 170. Therefore, the Reservation would not be covered by any mitigation agreed to by either Uintah or Duchesne counties under Senate Bill 170.

Alternatives 1-3: All of the above-mentioned impacts would occur.

Alternative 4, Restricted Development: Because 31 percent of the STSA is in a more restrictive leasing category (3) and would not be developed, impacts would be significantly less than those occurring in Alternatives 1, 2, or 3. However, the exact amount of the change cannot be predicted at this time.

Argyle Canyon/Willow Creek STSA

MAJOR ISSUES

There are 21,863 acres within the STSA. However, portions of this STSA lie within National Forest lands while others are in private and State ownership. The BLM administers a total of 12,877 acres within the STSA. Most of the Argyle Canyon/Willow Creek tar sand deposits are located in southwestern Duchesne County, about 18 miles north to 23 miles north-northeast of Price, Utah.

The following major issues were identified for tar sand development in the Argyle Canyon/Willow Creek STSA.

- **Soils.** Some soils within the STSA have a high erosion hazard and require special protective measures.
- **Water Resources.** The STSA contains wetlands or floodplains which have special characteristics requiring protective measures.
- **Wildlife.** The Argyle Canyon STSA contains crucial summer and winter habitat for Rocky Mountain elk and mule deer, as well as mule deer fawning habitat, all of which require protective measures.

ALTERNATIVES

Alternative 1, No Action/Development

All Federal acreage administered by BLM (12,877 acres) would be category 1, open to leasing (see Figure 2-30). This alternative would maximize the area available for oil and gas and tar sand development throughout the STSA. No special stipulations would be specified in open lease areas.

Alternative 2, Multiple Use (Preferred Alternative)

This alternative attempts to balance tar sand development with other resource uses. It does not attempt to completely protect other resources and resource uses from the effects of hydrocarbon development, nor does it provide for full hydrocarbon development. The entire STSA would be designated category 2 (see Figure 2-31).

The following discusses the issues previously identified and indicates their respective areas of concern. Note that acreages do not add because two or more resource categorizations overlap in some locations.

Soils (Category 2, 12,877 Acres). Most of the STSA consists of steep and broken slopes and soils with slopes exceeding 40 percent. These areas erode easily and, therefore, require the following special stipulations.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes that exceed 40 percent without written permission from the authorized officer of the Federal surface management agency.
- To minimize erosion, exploration, drilling, and other development activity will be allowed only from November 1 to April 1 when soils are dry or ground is frozen. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of the Federal surface management agency.

Water Resources (Category 2, 1,036 Acres). There are 1,036 acres of wetlands as defined in Executive Order 11990 and/or floodplains as defined in Executive Order 11988. It is recommended that the following areas be placed in category 2 to protect these resources:

Township 11 South, Range 11 East, Sec. 1: N $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 3: SE $\frac{1}{4}$, SW $\frac{1}{4}$; Sec. 4: S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 8: N $\frac{1}{2}$; Sec. 9: NW $\frac{1}{4}$, N $\frac{1}{2}$ NE $\frac{1}{4}$; Sec. 10: N $\frac{1}{2}$ NW $\frac{1}{4}$.

Stipulation:

- No occupancy or other surface disturbance will be allowed within 600 feet of wetland and floodplain environments. This distance may be modified when specifically approved in writing by the authorized officer of the Federal surface management agency.

Wildlife, Crucial Elk and Deer Range (Category 2, 9,765 Acres). The STSA contains crucial summer habitat for elk and deer, all of which could be lost through surface disturbance. The following areas should be placed in category 2 to protect this resource:

Township 11 South, Range 10 East, Sec. 9: Lots 1, 3, 4, and 5; Sec. 10: Lots 2, 3, and 4, S $\frac{1}{2}$; Sec. 11: Lots 3, 4, 5, S $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 14: W $\frac{1}{2}$ W $\frac{1}{2}$; Sec. 15: W $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ NW $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, SE $\frac{1}{4}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$, W $\frac{1}{2}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ NE $\frac{1}{4}$; Sec. 17: SE $\frac{1}{4}$, SW $\frac{1}{4}$, NE $\frac{1}{4}$, N $\frac{1}{2}$ NW $\frac{1}{4}$, SE $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 18: Lots 1, 3, 4, and 5, S $\frac{1}{2}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$ NW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 19: Lots 1, 2, and 4, SE $\frac{1}{4}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$; Sec. 20: E $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 21: NE $\frac{1}{4}$ SE $\frac{1}{4}$, SE $\frac{1}{4}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 22: S $\frac{1}{2}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$ SW $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 23: SW $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 24: N $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$; Sec. 25: NW $\frac{1}{4}$; Sec. 26: NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 28: N $\frac{1}{2}$ NE $\frac{1}{4}$; Sec. 29: W $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 30: E $\frac{1}{2}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$.

Township 11 South, Range 9 East, Sec. 13: NE $\frac{1}{4}$ W $\frac{1}{2}$, S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 14: E $\frac{1}{2}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ SE $\frac{1}{4}$.

Township 11 South, Range 11 East; Sec. 1: SW $\frac{1}{4}$; Sec. 3: SE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 4: SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 9: S $\frac{1}{2}$, NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 8: S $\frac{1}{2}$, S $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 10: All; Sec. 11: All; Sec. 12: S $\frac{1}{2}$, NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 27: All; Sec. 28: E $\frac{1}{2}$ E $\frac{1}{2}$; Sec. 33: NE $\frac{1}{4}$ NE $\frac{1}{4}$; Sec. 34: N $\frac{1}{2}$ N $\frac{1}{2}$.

Township 11 South, Range 9 East; Sec. 25: E $\frac{1}{2}$.

Township 11 South, Range 10 East; Sec. 20: SW $\frac{1}{4}$ SW $\frac{1}{4}$; Sec. 21: SW $\frac{1}{4}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 25: SW $\frac{1}{4}$; Sec. 26: E $\frac{1}{2}$ SW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 27: NW $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$, E $\frac{1}{2}$ NE $\frac{1}{4}$; Sec. 28: W $\frac{1}{2}$ W $\frac{1}{2}$, SE $\frac{1}{4}$ NW $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$; Sec. 29: E $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$, E $\frac{1}{2}$; Sec. 30: W $\frac{1}{2}$ NW $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$, SE $\frac{1}{4}$.

The geographic area described below overlaps the crucial deer and elk summer and winter ranges and is also considered crucial mule deer fawning habitat (2,040 acres).

Township 11 South, Range 10 East; Sec. 19: SE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 20: SW $\frac{1}{4}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 21: S $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 22: SE $\frac{1}{4}$ SW $\frac{1}{4}$; Sec. 27: NW $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ NE $\frac{1}{4}$; Sec. 28: S $\frac{1}{2}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$; Sec. 29: W $\frac{1}{2}$, SE $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$ NE $\frac{1}{4}$; Sec. 30: SE $\frac{1}{4}$, S $\frac{1}{2}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ NE $\frac{1}{4}$.

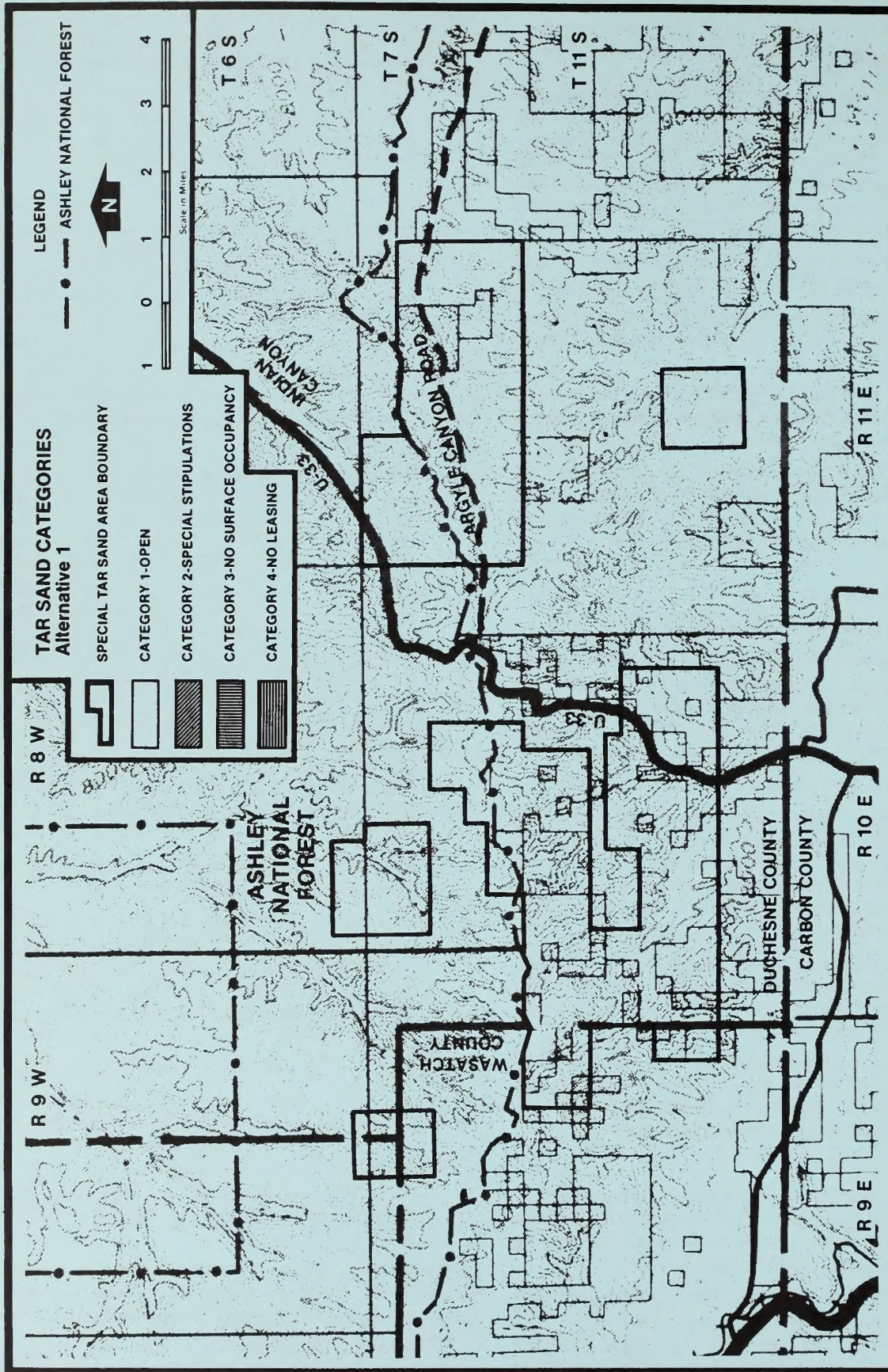


FIGURE 2-30

ALTERNATIVE 1, ARGYLE CANYON/WILLOW CREEK STSA

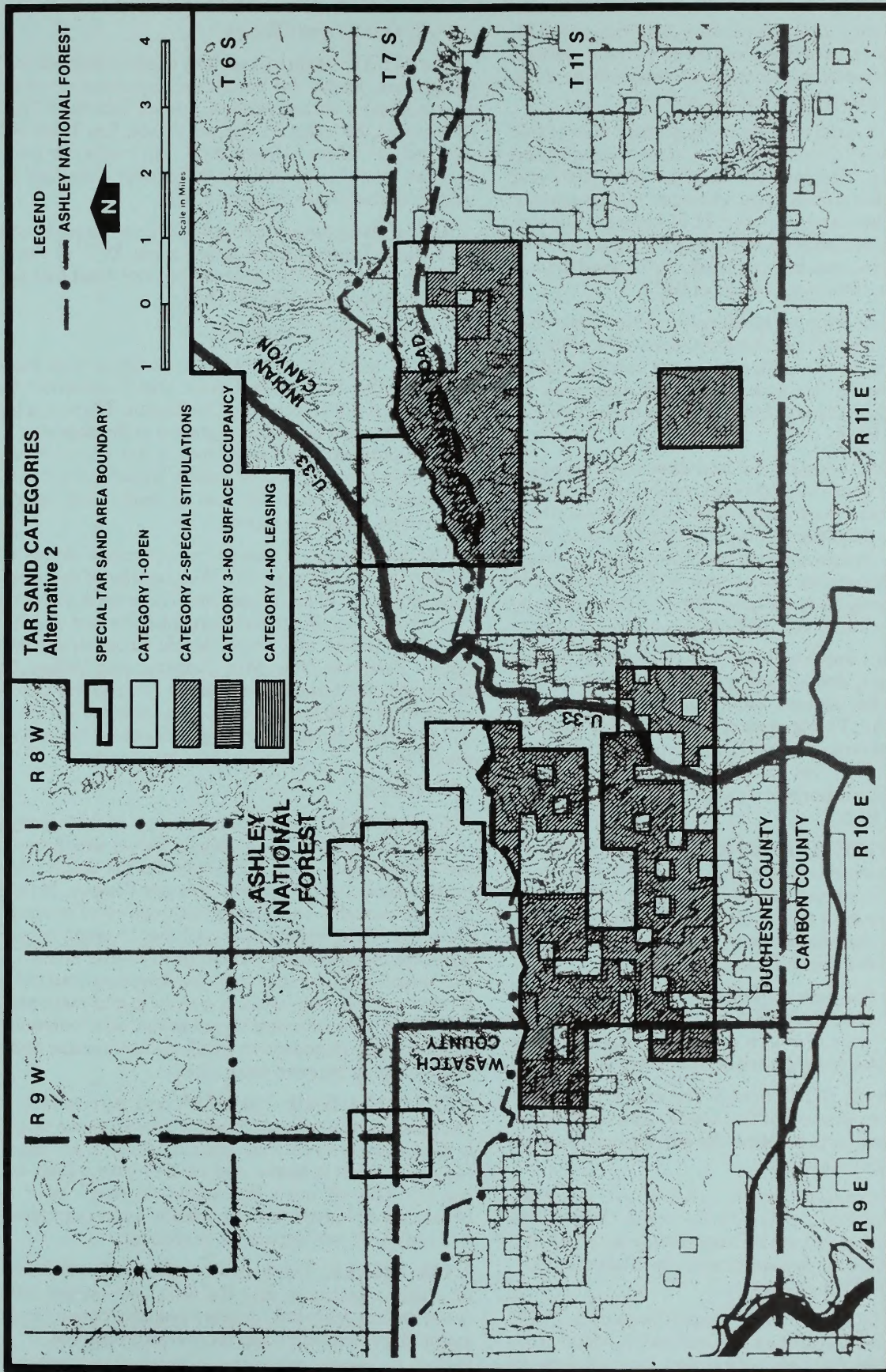


FIGURE 2-31
ALTERNATIVE 2, ARGYLE CANYON/WILLOW CREEK STSA

CHAP 2: ALTERNATIVE EVALUATIONS

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 40 percent without written permission from the authorized officer of the Federal surface management agency.
- No more than 25 percent of the surface area of this lease may be disturbed from surface mining at any given time. Reclamation must be completed and revegetation substantially advanced to the approval of the authorized officer of BLM before additional areas can be disturbed by mining. Exceptions to this requirement may be specifically authorized in writing by the authorized officer of BLM.
- No surface mining will be allowed in aspen vegetative communities without off-site enhancement of similar vegetative communities of equal wildlife value. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.
- To protect important elk and deer summer range and mule deer fawning areas, exploration, drilling, and other development activities will be allowed only from July 16 through May 17. This limitation does not apply to maintenance and operation of producing wells or mines. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.
- To protect important elk and deer winter range, exploration, drilling, and other development activities will be allowed only from April 1 through October 31. This limitation does not apply to maintenance and operation of producing wells or mines. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of BLM.

ALTERNATIVE 3, RESTRICTED DEVELOPMENT: This alternative places more emphasis on protecting the renewable resource values and the existing surface environment through a more restrictive designation. Category 3 would be designated for all areas specified as category 2 in Alternative 2 (see Figure 2-32).

Following are the issues previously identified and their respective areas of concern. Note that acreages do not add because two or more resource categorizations overlap in some locations (see legal descriptions in Alternative 2).

Soils (Category 3, 12,877 Acres): The entire STSA consists of slopes over 40 percent that erode easily and require special stipulations for protection. No surface occupancy is allowed in category 3 areas.

Water Resources (Category 3, 1,036 Acres): There are 1,036 acres of wetlands as defined in Executive Order 11990 and/or floodplains as defined in Executive Order 11988. It is recommended that the following areas be placed in category 3 to protect these resources:

Wildlife, Crucial Elk and Deer Range (Category 3, 12,193 Acres): The STSA contains crucial summer habitat for elk and deer. All of this habitat could be lost through surface-disturbing activities. The following areas should be placed in category 3 to protect this resource.

AFFECTED ENVIRONMENT

Air Quality and Climate

The STSA is within a Class II air quality designation. This designation allows for moderate deterioration normally accompanying well-controlled growth. Dinosaur National Monument, 84 miles to the northeast, has been recommended for Class I designation. No major air pollution sources or polluted airsheds have been identified in the vicinity of the Argyle Canyon STSA.

Annual precipitation in Argyle Canyon ranges from 14 to 19 inches. Temperatures range from -39°F in winter to 104°F in summer. The June-September frost-free season averages approximately 120 days.

Geology and Topography

The tar sand deposits occur in sandstones of the delta facies of the Parachute Creek and Evacuation Creek members of the Green River formation. There is a lack of site-specific data on the stratigraphy of the deposits. Sandstones containing tar sand deposits are interbedded with and grade laterally into oil shale. Therefore, most of the hydrocarbons is probably the oil shales with which the sandstones are interbedded.

The topography is mainly mountainside slopes which range from 4 to 15 percent. The majority of the area contains slopes of 40 to 70 percent. The area is dissected by numerous intermittent and perennial streams which drain from west to east and south. Argyle Creek drains into the Green River via Nine Mile Canyon, and Willow Creek drains into the Green River via the Price River. Elevations range from 9,800 feet on the northwestern portions of the STSA down to 8,000 feet in Argyle Creek on the east side of the STSA.

Minerals

TAR SAND: The largest outcrop of oil-impregnated rock occurs on the divide (Argyle Ridge) which separates the Minnie Maud Creek drainage on the south from the north-draining streams north of Argyle Canyon. No specific data are available concerning outcrops of oil-impregnated rock, but it is generally observed that bitumen concentrations are disseminated and occur in former stream channels. Small surface mines might be developed, but the major recovery of bitumen would be from in-situ methods. The STSA has a low potential for economic development of tar sand because deposits are small, discontinuous, and have relatively little bitumen saturation.

OIL AND GAS: The STSA and surrounding areas have moderate to low potential for oil and gas development. Drilled wells are relatively shallow (4,000-5,000 feet). The high paraffin oil is heavy and tar-like with a high specific gravity. The oil must be heated to reach pour point. Unheated oil has the same consistency as petroleum jelly and is difficult and expensive to recover.

OIL SHALE: This area was not included in the known oil shale lease areas, and the area has low potential for development. Very little data are available concerning existing oil shale resources and recoverable reserves.

SALEABLE MINERALS: Sand and gravel have low unit value. For economic reasons, the few scattered deposits will be developed only if there is a substantial increase in construction in the immediate area. However, there is no indication this will happen in the foreseeable future, except

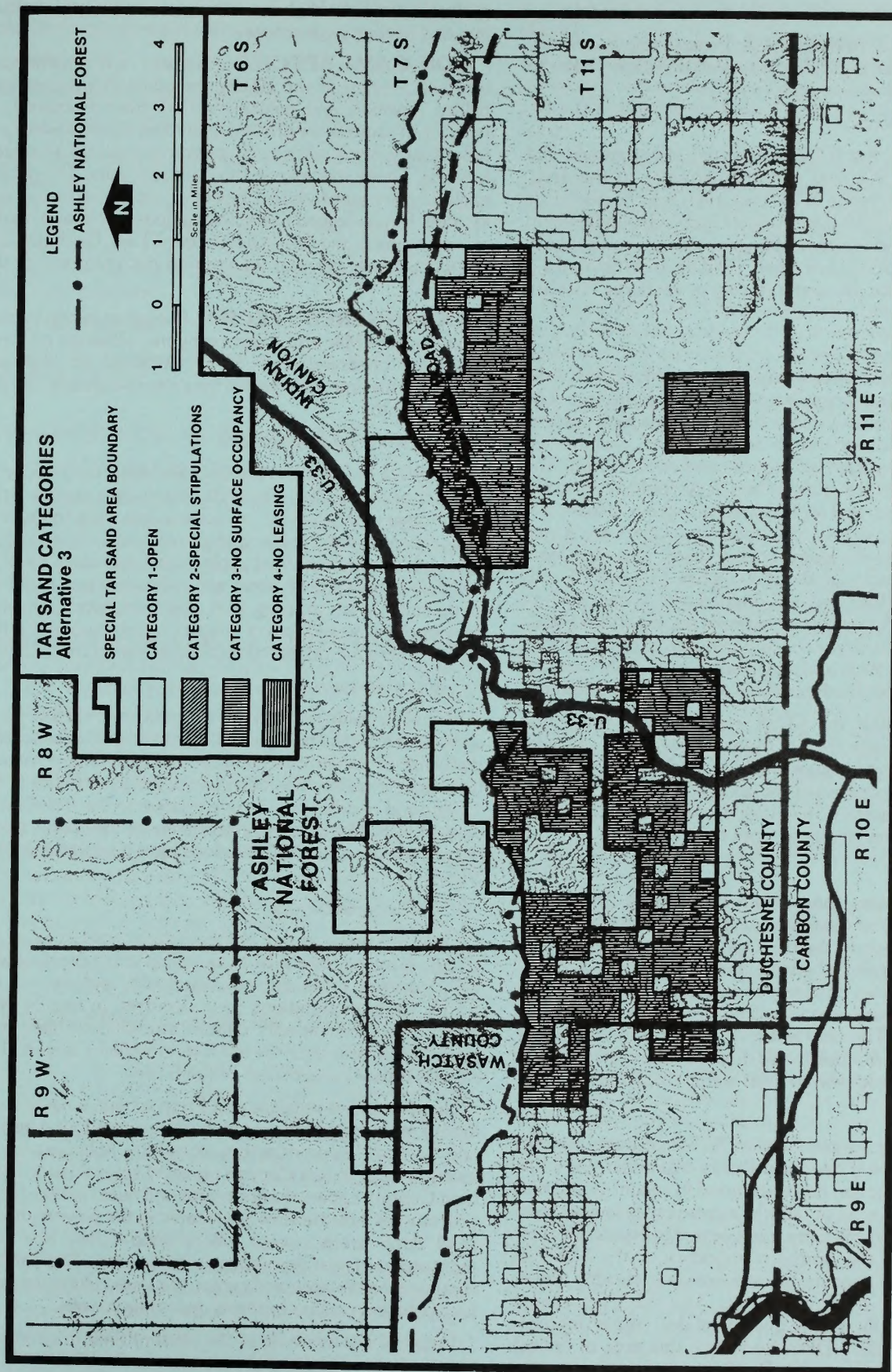


FIGURE 2-32

ALTERNATIVE 3, ARGYLE CANYON/WILLOW CREEK STSA

for deposits used for road construction and maintenance.

LOCATABLE MINERALS: Prospecting has occurred near and within the STSA; however, there have been no significant discoveries to date.

Water Resources

Floodplains in the STSA are found along Argyle and Willow Creeks, the only perennial streams in the area. Average daily discharge in Willow Creek is 8 cfs; discharge records are not available for Argyle Creek. Groundwater in the STSA is found in stream alluvium and rock outcrops in side canyons. Springs are small, yielding an estimated 1-2 gallons per minute. No water quality or recharge data are available.

Soils

The major soils in this unit are Midfork, GT, JS, ET, Adel and Podo; which make up about 65 percent of the area. The remaining area contains minor soils with some rock outcrop and badland. Midfork and JS are very deep, well-drained soils with surface layers of gravelly and cobbly loam. The underlying layers are gravelly and very cobbly clay loam. Adel soils are deep and well drained with gravelly loam and clay loam surface layers. The underlying layers are a mixture of very gravelly loam, cobbly loam, and clay loam resting on sandstone at about 50 inches. GT and ET soils are moderately deep and well drained with a loam surface layer. The underlying layer is clay loam resting on hard shale at about 36 inches. Some shallow soils also exist in the area. Podo soils are shallow and very shallow with shaly loam soil through the soil profile. Hard shale occurs at about 8 inches.

Some soils within the STSA require special protection from erosion. Productivity of the area is generally low, with some areas having medium and high productivity. Because of the general steepness of the area, potential for reclamation is poor. On areas with moderate slopes with deep soils, reclamation potential ranges from fair to good.

Vegetation

Vegetation types range from Douglas fir and aspen stands at the higher elevations near the northern boundary of the STSA down to the big sagebrush-grass community along Argyle Creek. In between these communities mountain browse species dominate the slopes. Floodplain vegetation includes cottonwood, willow, greasewood, saltgrass, and sagebrush. The only wetlands are found along Argyle Creek within the floodplain. No threatened and endangered plant species are known to exist within this STSA.

Wildlife

BIG GAME: Argyle Canyon STSA contains two big game species--mule deer and Rocky Mountain elk. Mule deer fawn production has been good in recent years, and the herd appears to be slowly increasing following hard winters in 1978-80. Elk were transplanted to National Forest lands bordering the northern boundary of the STSA in 1976. This herd appears to be increasing steadily and is expanding into available range. The STSA contains summer habitat for a large number of deer and an increasing number of elk. UDWR considers this area of critical importance to both species. Black bear habitat is also provided within the STSA.

UPLAND GAME: Portions of the STSA currently provide year-round habitat for blue, ruffed, and sage grouse as well as cottontail rabbits and mourning doves. The area

to the west of U.S. Highway 191 is also important for strutting and nesting sage grouse.

NON-GAME SPECIES: A variety of non-game species are present in the STSA, including coyote, yellow-bellied marmot, and golden-mantled ground squirrel. A number of raptors are present, including marsh hawk, red-tailed hawk, Swainson's hawk, prairie falcon, and American kestrels. These species are common residents. The golden eagle is a frequent visitor; however, no nests have been located. Rough-legged hawk, ferruginous hawk, and merlin are uncommon and do not nest in the STSA. Goshawk and Cooper's hawk are also uncommon but may nest in the area.

ENDANGERED SPECIES: Peregrine falcon habitat exists in Nine Mile and Argyle canyons, although no birds have been observed in the STSA. Although no nests are known at this time, bald eagles frequent the area during the winter months.

Livestock and Agriculture

The State of Utah and private individuals own nearly 95 percent of this STSA. Since BLM manages such a small percentage of the surface, no survey data exist to indicate forage production, existing improvements, or extent of livestock production. Best professional estimates by BLM are that between 8-10 acres are necessary per AUM on lands suitable for grazing. It is unknown how large-scale development would affect livestock production in this STSA. There are no agricultural lands within the STSA.

Visual Resources

This area contains a variety of landforms: ridges, drainages, benchlands, and canyons. Tans and grey-green colors dominate in the exposed soils and pinyon-juniper vegetation. Scenic quality has been evaluated as A (high) in the foreground-middleground zone relative to the travel corridors of U.S. Highway 191. Sensitivity of viewers is considered medium. No VRM decisions have been made for the STSA.

Cultural Resources

Little is known about archaeological resources in the STSA. A major class II BLM sampling effort conducted in 1977 covered areas immediately south and east of the STSA. Early explorations have occurred in nearby Nine Mile Canyon. Site-specific cultural studies have been completed along and near the left fork in Indian Canyon. This canyon crosses one corner of the STSA.

Nearby studies indicate that Fremont and Anasazi rock art are most frequently found. Early surveys found villages and fortifications on ridgetops along Nine Mile Canyon. FS inventories in Indian Canyon revealed several early Twentieth Century cabins along streams and near springs. Statistical studies indicate sites are located in the pinyon-juniper-sand dune areas except where sand dunes and rock outcrops exist near permanent water sources. Rock art and small seasonally occupied camps are found along the interface between canyon bottoms and canyon walls.

Data are not available at the present time to determine the significance of cultural resources in the STSA.

Recreation

No developed recreation sites exist; however, hunting opportunities exist for rabbit, grouse, deer, and elk. UDWR issued 70 bull elk permits in 1982. Other opportunities exist

for geologic sightseeing and viewing rock art. ORV access is limited because of rough terrain.

Wilderness

No WSAs have been identified in this area.

Existing Land Uses and Land Use Plans

Only one Federal right-of-way traverses the STSA. It is for a road on the extreme northern portion of the area. In addition, U.S. Highway 191 bisects the STSA in the north-south direction, and several county roads provide limited access for private individuals. Both Duchesne and Utah counties have zoning ordinances regulating development within their counties.

Socioeconomics

Refer to the Socioeconomics section of Asphalt Ridge/White Rocks STSA.

ENVIRONMENTAL CONSEQUENCES

Oil and Gas and Tar Sand Resources

The nature of the tar sand deposit may provide for a small-scale surface mine on the outcrop and an in-situ development northward. In-situ technology is currently unfeasible, but may later become economic. If development of the tar sand were to occur, no impacts to other mineral resource values would be anticipated.

ALTERNATIVE 1, NO ACTION/DEVELOPMENT: This alternative would allow tar sand development on 12,877 acres of public land with general stipulations imposed; however, it is anticipated that, if surface mining occurred, it would be on a small scale. Tar sand development would, therefore, occur mostly from in-situ recovery. Once extracted, future uses of the tar sand resource would be foregone.

ALTERNATIVE 2, MULTIPLE USE (PREFERRED ALTERNATIVE): Tar sand development could occur; however, the entire STSA would have special stipulations imposed to protect soils, water resources, and wildlife. Because such a small amount of surface mining is expected, imposed stipulations would be extensive. Also, present technology and economics of in-situ recovery would most likely limit impacts to the tar sand resource.

ALTERNATIVE 3, RESTRICTED DEVELOPMENT: This alternative would place the entire STSA in category 3, no surface occupancy, to protect the resources mentioned in Alternative 2. By placing all of these areas into category 3, there would be no technologically feasible method to extract mineral resources; therefore, 12 to 15 million barrels of bitumen would be left in place and recovery of 3 to 8 million barrels of bitumen would not be available.

Other Mineral Resources

The STSA has no known significant locatable or saleable mineral deposits, nor is it considered valuable for potential oil and gas production. The STSA falls outside the known oil shale lease areas and is not considered important. The only exceptions are several pre-1920 unpatented oil placer claims that have not been examined to determine their validity.

ALTERNATIVE 1, NO ACTION/DEVELOPMENT

Locatable Minerals: The STSA falls within the oil shale withdrawal boundary, which closes the area to location under the 1872 Mining Law. Therefore, no impacts would occur.

Leasable Minerals: Imposing no restrictions other than general surface protection stipulations would provide optimum development potential. This would encourage exploration and subsequent mining, making such activity more economically attractive because of reduced environmental costs.

Saleable Minerals: This would restrict the gathering and removal of building stone, if such activity unreasonably interfered with mineral leasing. Open leasing could preclude the establishment of designated building stone areas.

ALTERNATIVE 2, MULTIPLE USE (PREFERRED ALTERNATIVE)

Locatable Minerals: No impact would occur to the locatable mineral program because of restrictions in the 1872 Mining Law.

Leasable Minerals: Because of environmental constraints, certain areas having marginal potential for economic development might not be mined. In most cases, the risk and high front-end investment associated with exploration could discourage development in those areas with additional high reclamation costs.

Saleable Minerals: This alternative could provide the opportunity to delineate building stone sale areas where mineral leasing for oil and gas or tar sand was currently uneconomical. This would afford an interim period allowing collection of surface deposits. Because of the small-scale operations, impacts to other renewable resource values would be minimal.

ALTERNATIVE 3, RESTRICTED DEVELOPMENT

Locatable Minerals: There would be no impact to locatable minerals. The 1872 Mining Laws would be exempt from the category 3 no surface occupancy stipulation. The current oil shale withdrawal has provided the same level of protection since 1930.

Leasable Minerals: This alternative would be so restrictive that development of surface mineable deposits would not be possible. Only those oil and gas reservoirs amenable to slant drilling would be available for development. There are no significant deposits that could be considered for underground mining. However, little or no surface exploration would be expected because of the low economic potential.

Saleable Minerals: The no surface occupancy stipulation could preclude the establishment of building stone areas where extraction could unreasonably interfere with renewable resource values. During peak construction periods, these building stone areas presently receive moderate pressure from local residents. Perhaps building stone collection could be possible within certain constraints, such as restrictions to designated roadways.

Other Resources Values

AIR QUALITY: Many of the problems (i.e., wind-

CHAP 2: ALTERNATIVE EVALUATIONS

blown particulates) would be similar to surface mining of coal. Additionally, all surface processing (hot water, solvent, and surface retorting) would require the introduction of heat. These boilers or furnaces would probably be fired by residual oil or coal and would result in emissions of SO₂, NO, NO₂, and particulate matter. Removal of any ash, coke, waste water, or other materials would require adequate controls.

In-situ technologies could also result in air quality impacts. Both the steam-drive and fire-flooding processes burn coal or the produced crude to operate engines driving the steam generators or air compressors. The combustion process results in the production of SO₂ and particulate matter and the formation of NO and NO₂.

Analysis of detailed air quality impacts are largely beyond the scope of this EIS and will be addressed in detail in plans of operation. A more detailed discussion of air quality appears in Volume I of this EIS.

GEOLOGY AND TOPOGRAPHY: If surface mining were to occur in the area, it would irreparably alter existing topographic features. These features (i.e., ridge tops and drainage areas) could be lost by overburden removal or filling by waste disposal. Reclaiming to original contour or blending reclaimed areas with adjacent undisturbed areas would be highly unlikely. In-situ development would not result in major impacts to topography; however, a few feet of subsidence could occur.

Alternative 1, No Action/Development: All of the above-mentioned impacts would occur. The amount of disturbance would depend on the amounts recovered and locations of development.

Alternative 2, Multiple Use (Preferred Alternative): All 12,877 acres would have special category 2 stipulations for watershed. Slopes in excess of 40 percent would not be occupied without written permission of the BLM. Approximately 1,036 acres (floodplains and water sources) would not be occupied. Thus the impacts described in the Water Resources section above would not occur in these areas. There are special stipulations on approximately 12,193 acres to protect wildlife habitat. These stipulations would limit the impacts to topography described above.

Alternative 3, Restricted Development: Under this alternative, 12,877 acres would be subject to no surface occupancy. Thus, impacts to topographic features would not occur on this acreage.

SOILS: Erosion could increase where surface disturbance accompanies oil and gas and tar sand development. Soils of concern include soils on steep slopes with high erosion hazard, which includes most of this area, soils on unstable slopes, and soils under wet or saturated conditions. These conditions could produce excessive on-site water erosion and off-site soil and water degradation. The amount of erosion would depend on factors such as soil type, slope steepness, soil stability, and extent of development. Off-site degradation could result from soil deposition and increased sediment and salt loads downstream. Sediment and salt could continue downstream to the Green and Colorado rivers.

Alternative 1, No Action/Development: Category 1 general stipulations could provide protection for the soil resource where favorable soil and landscape conditions exist and where surface disturbance is not extensive. These

stipulations, however, would not provide adequate protection in areas where surface disturbance was extensive (i.e., surface mining) and where steep or unstable soil conditions exist.

Alternative 2, Multiple Use (Preferred Alternative): This alternative would provide access for oil and gas and tar sand development and still protect the soil resource. Soils with high and very high erosion hazard would be protected by special stipulations to control accelerated erosion and to provide for rehabilitation of disturbed soils, yet allow for development of the mineral resources. Shut-down stipulations during periods of wet and unstable soil conditions would apply. This would protect soils when they are most susceptible to damage and resultant erosion. Occupancy during other periods would be restricted. The no surface occupancy stipulation on slopes greater than 40 percent without permission of the authorized officer would apply to oil and gas and tar sand development. Occupancy could be authorized if the need existed and where proper mitigation was feasible.

Alternative 3, Restricted Development: This alternative would restrict the designated area (12,877 acres) to no surface occupancy. Oil, gas, and tar sand development would not be permitted. Accelerated erosion would not occur from these activities. Soil, erosion, and runoff would not affect downstream water.

VEGETATION: The greatest impact to vegetation would be the loss of topsoil associated with surface-disturbing activities. The greatest threat would come from large-scale development, such as surface mining for tar sand. Loss of topsoil would also occur in concentrated areas associated with service roads and necessary storage areas. Presently, the small tracts of timber would make commercial harvesting economically unfeasible.

Revegetation on large-scale surface-mined areas demands topsoil be in place to counterbalance the sterility of the mining spoil. Topsoil should also be used on revegetated service areas to aid in a more rapid, uniform vegetation recovery. Precipitation in the area is sufficient to support revegetation efforts but could be difficult because of steep slopes.

Recovery time following revegetation could take a minimum of 5 years for herbaceous and initial shrub establishment. It would not be necessary nor practical to plant trees. Return to the natural vegetation community, especially in forested areas, would take decades.

Alternative 1, No Action/Development: All the above-mentioned impacts would occur. The entire 12,877 acres would be placed in category 1.

Alternative 2, Multiple Use (Preferred Alternative): All acres would be placed in category 2 (special stipulations). Impacts as discussed above would occur on areas where surface disturbance was allowed.

Alternative 3, Restricted Development: Because all acreage would be placed in category 3 (no surface occupancy), no impacts would occur.

WATER RESOURCES: Impacts to floodplains resulting from oil and gas and tar sand development along Argyle Creek could include surface disturbance and contamination of surface water and groundwater. Surface mining probably would not impact any deep aquifer; however, small, shallow alluvial aquifers could be lost because of tar

sand and overburden removal. In-situ mining could impact aquifers through injection of solvents and steam or burning, which would affect groundwater in the tar sand zone. Aquifer flows could change or dry up because of subsidence.

Alternative 1, No Action/Development: All of the above-mentioned impacts to floodplains could occur. However, Executive Orders 11990 and 11988 afford protection to floodplains.

Alternative 2, Multiple Use (Preferred Alternative): The stipulation to allow no surface occupancy or disturbance within 600 feet of live water would generally be adequate to protect floodplains from the impacts discussed above. This stipulation would apply to both oil and gas and tar sand development.

Alternative 3, Restricted Development: This alternative would provide the maximum amount of protection to the 1,036-acre floodplain in the this STSA. A no surface occupancy stipulation would be enforced rather than a stipulation allowing development 600 feet from live water.

WILDLIFE: Impacts to wildlife would occur in several different ways: (1) direct loss of habitat from mining, road construction, etc.; (2) reduced habitat quality where reclamation of vegetation was poor or slow; (3) possible modification to migration routes; (4) loss of water or access to water; (5) loss or disturbance of fawning, calving, or nesting areas; and (6) secondary impacts from increased human access and disturbance.

Mule deer and elk summer ranges in the STSA could be severely impacted by hydrocarbon development. The area is considered crucial range by UDWR. An additional decrease in population numbers could occur, depending on effects on fawning areas, migration corridors, water availability, and other elements essential for deer and elk summer habitat. Many impacts would be permanent.

Blue, ruffed, and sage grouse habitats could be lost through surface-disturbing activities, as well as cottontail rabbit and mourning dove habitat. A loss of upland game and hunting opportunities could result.

Non-game species which use the STSA during all or parts of their life cycle would be lost or permanently displaced by surface-disturbing activities. Raptors within the STSA could be reduced in numbers and habitat could be lost, depending on the extent of tar sand development.

Alternative 1, No Action/Maximum Development: All of the above-mentioned impacts could occur.

Alternative 2, Multiple Use (Preferred Alternative): Tar sand development would be allowed on category 2 areas, although more stringent stipulations would be in effect. Impacts to deer and elk summer range could occur; however, some mitigation would occur through category 2 stipulations requiring off-site enhancement of aspen groves and a 25-percent restriction on lease disturbance. Impacts to sage grouse would be mitigated by restricting surface occupancy on known strutting grounds and prohibiting surface disturbance in nesting habitat. Impacts to other small game or non-game species would be limited to disturbance areas.

Alternative 3, Restricted Development: Impacts to deer, elk, sage grouse, and other small and non-game species would be protected by placing all category 2 areas into a no surface occupancy zone.

LIVESTOCK GRAZING: In those areas suitable for livestock grazing, best estimates would indicate 8 to 10 acres are needed for an AUM. The impacts on livestock production are unknown because there are no existing surveys and because BLM controls less than 10 percent of the STSA's surface estate suitable for livestock use.

Alternative 1, No Action/Development: Impacts would be as discussed above. The entire STSA would be designated category 1.

Alternative 2, Multiple Use (Preferred Alternative): The entire STSA would be designated category 2 (special stipulations). Impacts as discussed above would occur on areas where surface disturbance was allowed.

Alternative 3, Restricted Development: Because the entire STSA would be designated category 3, impacts to livestock would not occur.

VISUAL RESOURCES: VRM objectives for the area have not been determined. However, high scenic quality and medium sensitivity are present. People are moderately concerned about activities that disrupt scenic quality and foreground-middleground distance zones from travel corridors.

Alternative 1, No Action/Development: If large-scale landform modification were involved in hydrocarbon development and were within view of travel corridors, full development would have a negative impact on scenic quality.

Alternative 2, Multiple Use (Preferred Alternative): Visual quality could be protected, depending on location, scale of development, and visibility of facilities.

Alternative 3, Restricted Development: Visual qualities would be protected by the category 3 designation.

CULTURAL RESOURCES: Hydrocarbon development could result in various activities which would impact archaeological values. These include (1) surface mining; (2) construction of drill pads and support facilities; (3) rights-of-way for pipelines/powerlines; and (4) waste disposal. Secondary impacts could be expected through vandalism and increased human activities.

Prior to entry upon the land or surface disturbance for mining, drilling, or other purposes, the lessee would be required to submit for approval an APD, exploration plan, or plan of operation describing the methods and actions proposed for cultural resource protection and clearance. This would apply to any alternative.

Alternative 1, No Action/Development: A CHL could be highly destructive to archaeological sites. Normal mitigation for these resources is avoidance or salvage. Large-scale development activities would preclude the former, and salvage would be the only option. Secondary impacts such as vandalism could not be avoided.

Alternative 2, Multiple Use (Preferred Alternative): Some disturbance to cultural resources would be avoided in areas where stipulations were enforced to protect other resources. However, salvage might be the only option in areas with large-scale development activities. Secondary impacts such as vandalism could not be avoided.

Alternative 3, Restricted Development: The no surface occupancy stipulation would provide the protection necessary to protect all lands characterized as potentially valuable for cultural resources. Secondary impacts such as vandalism could not be avoided.

RECREATION: Hunting, sightseeing, viewing rock art, and ORV use opportunities exist in this area. However, because of the remote location and availability of these opportunities closer to population centers and the large amount of private land within the STSA, actual use is low.

Alternative 1, No Action/Development: The area is highly scenic and rated A in a VRM evaluation; consequently, activities occurring within view of travel corridors would have a negative impact on sightseeing.

Alternative 2, Multiple Use (Preferred Alternative): All mineral extraction activities screened from view of those traveling the principal access roads would cause minimum disruption of scenic quality. There could be some displacement of big game animals, which could affect hunting opportunities. Little ORV activity occurs in the area.

Alternative 3, Restricted Development: Because the area receives a minimum of recreational use, no surface occupancy would result in little, if any, negative impacts to recreation activities.

LAND USES AND LAND USE PLANS: U.S. Highway 191 and several county roads could be severely impacted by tar sand development. Surface mining would obliterate these roads. In-situ development could avoid physical disturbance of most roads; however, some subsidence could occur. Any development of tar sand would require many additional rights-of-way for new linear facilities or for reconstruction of existing roads.

Alternative 1, No Action/Development: This alternative would have the highest potential for conflict with existing rights-of-way. All impacts described above could occur.

Alternative 2, Multiple Use (Preferred Alternative): This alternative would have slightly less impacts when compared to Alternative 1. Although the entire STSA would be placed in category 2, development could still occur.

Alternative 3, Restricted Development: Because the entire STSA would be designated category 3, the above-mentioned impacts would not occur. Neither State nor county roads would be impacted.

SOCIOECONOMICS. Carbon and Duchesne counties would be most heavily impacted by development of this STSA. Because of the location of the STSA and existing access roads, Carbon County would receive most of the direct impacts, while Duchesne County would be involved to a lesser degree.

A large part of the construction work force would come from outside the two county area. There are not enough workers available in Carbon County to fill many of the anticipated jobs. More workers would be available in the Carbon County area if current decreases in coal production continue. Some additional workers could move into Duchesne County and drive the extra distance if housing and services were available.

It is anticipated that basic services such as sewer and water systems, fire and police protection, and schools and hospitals could not accommodate the expected population increases in Carbon County and, to a lesser degree, in Duchesne County.

Many of the impacts could be mitigated through the use of Senate Bill 170 which requires companies to agree to mitigate impacts before construction begins. This is not true for the Ute Indian tribe, because they are not covered

by Senate Bill 170. Therefore, they would not be covered by any mitigation measures required by Duchesne County.

Alternative 1, No Action (Development) and Alternative 2, Multiple Use (Preferred Alternative): All of the above mentioned impacts would occur. However, they would be slightly less under Alternative 2 because seasonal restrictions on surface disturbance could slightly limit development.

Alternative 3, Restricted Development (Resource Protection): Because surface disturbance would not be allowed on any of the STSA, development would not take place, and no impacts would occur.

Sunnyside STSA (Northern Portion)

MAJOR ISSUES

The northern portion of the Sunnyside STSA is located in southern Duchesne County and contains approximately 33,072 acres administered by BLM's Diamond Mountain Resource Area. The following issues were identified with development of tar sand in that portion of the Sunnyside STSA falling within the Diamond Mountain Resource Area.

- *Soils.* There are soils within the Vernal District portion of the STSA having a high erosion hazard. These soils require special protective measures.
- *Water Resources.* The STSA contains wetlands or floodplains having special characteristics requiring protective measures. There are Federal lands containing important springs requiring special protection. Water is scarce in the STSA.
- *Archaeology.* The STSA encompasses a portion of the Nine Mile Canyon Archaeological District. This canyon is nationally known for its varied and richly abundant rock art and was nominated to the National Register of Historic Places in February 1974.
- *Threatened or Endangered Species.* The northern portion of the STSA contains scattered populations of Uinta Basin hookless cactus, *Sclerocactus glaucus*. This species occurs on dry gravelly soils on hills and benches.
- *Recreation and Visual Resources:* The Nine Mile Canyon area of the STSA contains outstanding scenery and has been rated as a VRM Class II area.

ALTERNATIVES

Alternative 1, No Action/Development

Both competitive CHLs and conversions would be subject to the oil and gas category system established in 1975. That analysis did not identify any lands having special or critical resource values in that portion of the STSA falling within the Vernal District. Therefore, all Federal lands (approximately 33,072 acres) within the STSA would be classified as category 1, open to leasing (see Figure 2-33). Oil and gas production and tar sand exploration (under lease) and development could occur with mitigation established in APDs, exploration plans, and plans of operation. Although category 1 areas do not have special stipulations, site-specific stipulations could be developed when APDs

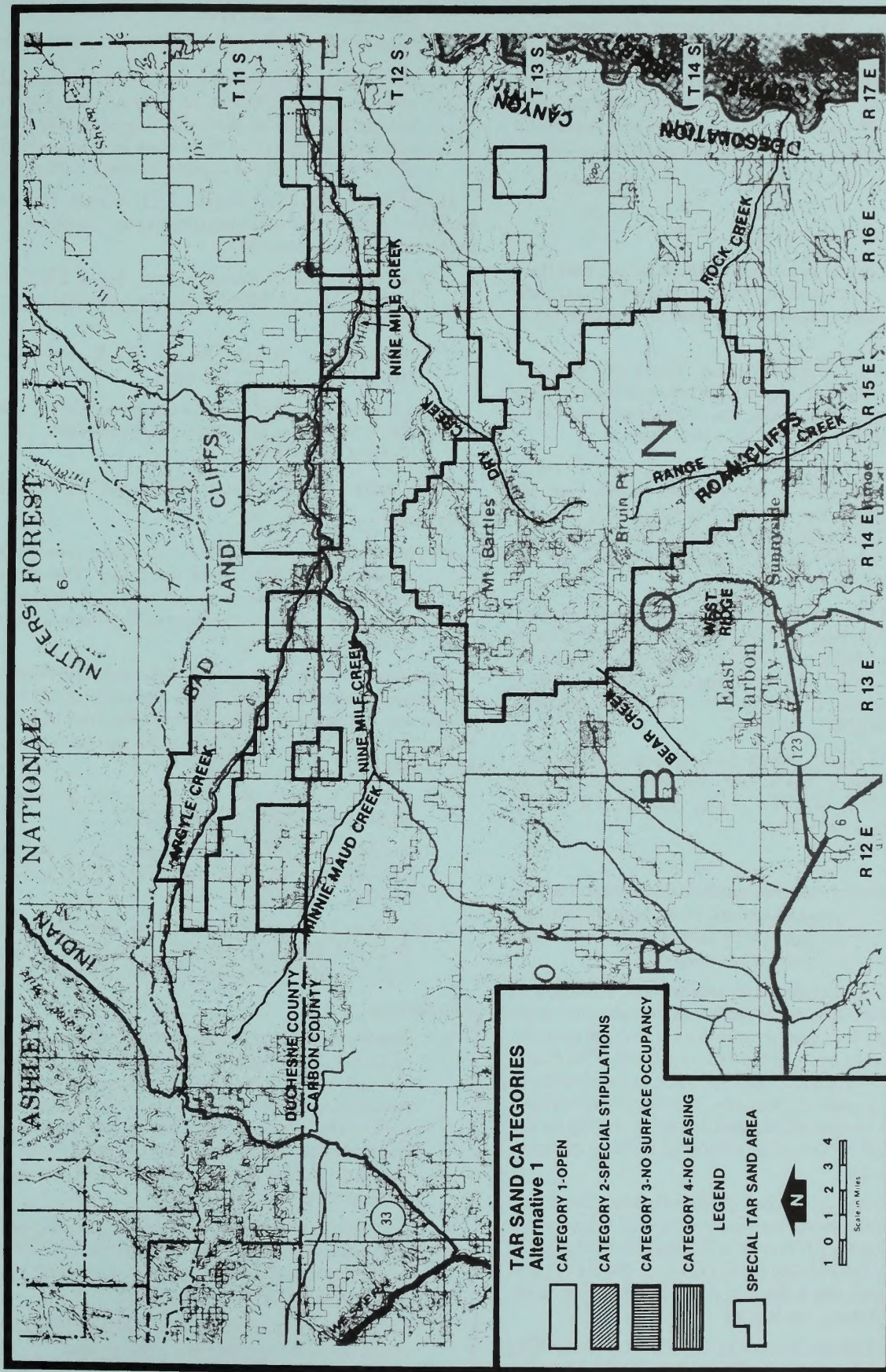


FIGURE 2-33
ALTERNATIVE 1, SUNNYSIDE STSA (NORTHERN PORTION)

CHAP 2: ALTERNATIVE EVALUATIONS

and plans of operation were submitted.

Alternative 2, Multiple Use (Preferred Alternative)

This alternative uses new inventories and studies and considers the overall value of both the renewable resources and the subsurface mineral resource values. The following lists the categories and approximate acres and percent of area in each. (Figure 2-34 shows locations of categories.)

Category	Acres	Percent
1	9,660	29
2	23,412	71

The following are previously identified issues and their respective areas of concern: Note: Acreages do not add because two or more resource categorizations overlap in some locations.

Soils (Category 2, 15,120 Acres). There are approximately 15,000 acres within the STSA having a high erosion hazard. To protect these soils, the recommendation is to place them in category 2. The area includes:

Township 11 South, Range 12 East, Sec. 7: NE $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 8: N $\frac{1}{2}$; Sec. 10: N $\frac{1}{2}$, W $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 11: N $\frac{1}{2}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$; Sec. 12: All; Sec. 13: N $\frac{1}{2}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 26: All; Sec. 27: All; Sec. 28: NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 29: All; Sec. 33-35: All.

Township 11 South, Range 13 East, Sec. 6-7: All; Sec. 8: N $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 9-10: All; Sec. 15: All; Sec. 17: All; Sec. 18: NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 20: N $\frac{1}{2}$; Sec. 21: N $\frac{1}{2}$, S $\frac{1}{2}$ SW $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 22: All; Sec. 25: N $\frac{1}{2}$, SW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 31: N $\frac{1}{2}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$.

Township 11 South, Range 14 East, Sec. 21: E $\frac{1}{2}$; Sec. 22: SW $\frac{1}{4}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$; Sec. 27: W $\frac{1}{2}$; Sec. 28: E $\frac{1}{2}$; Sec. 30: N $\frac{1}{2}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$; Sec. 31: NE $\frac{1}{4}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$, S $\frac{1}{2}$.

Stipulations:

- No occupancy or other surface disturbance will be allowed on slopes in excess of 40 percent without written permission from the authorized officer of the Federal surface management agency.
- To minimize soil damage, exploration, drilling, and other development activity will be allowed from November 1 to April 1 only during dry soil periods, over a snow cover, or on frozen ground. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of the Federal surface management agency.

Water Resources (Category 2, 920 Acres). There are approximately 920 acres of wetlands as defined in Executive Order 11990 (May 24, 1977) and/or floodplains as defined in Executive Order 11988 (May 24, 1977) within the STSA. It is recommended that the following areas be placed in category 2 to protect these resources:

Township 11 South, Range 12 East, Sec. 8: NE $\frac{1}{4}$ NE $\frac{1}{4}$; Sec. 10: NW $\frac{1}{4}$; Sec. 13: SW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{4}$ NW $\frac{1}{4}$.

Township 11 South, Range 13 East, Sec. 18: SE $\frac{1}{4}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 20: SW $\frac{1}{4}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 25: SW $\frac{1}{4}$.

Township 11 South, Range 17 East, Sec. 31: S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 33: NW $\frac{1}{4}$.

Stipulations:

- No occupancy or other surface disturbance will be allowed within 600 feet of wetland and floodplain environments. This distance may be modified when specifically approved in writing by the authorized officer of the Federal surface management agency.

Water Resources (Category 2, 1,080 Acres). The STSA includes 1,080 acres containing important springs requiring protection. These areas are:

Township 11 South, Range 12 East, Sec. 8: NE $\frac{1}{4}$ NW $\frac{1}{4}$, S $\frac{1}{2}$ N $\frac{1}{2}$; Sec. 12: NE $\frac{1}{4}$ SW $\frac{1}{4}$; Sec. 26: W $\frac{1}{2}$; Sec. 27: NE $\frac{1}{4}$ NE $\frac{1}{4}$;

Township 11 South, Range 13 East, Sec. 7: NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 22: W $\frac{1}{2}$ NE $\frac{1}{4}$.

Township 11 South, Range 14 East, Sec. 22: NE $\frac{1}{4}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 23: SE $\frac{1}{4}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 33: S $\frac{1}{4}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$.

Township 11 South, Range 16 East, Sec. 33: SE $\frac{1}{4}$ SW $\frac{1}{4}$.

Stipulation:

- No occupancy or other surface disturbance will be allowed within 600 feet of live water. This distance may be modified when specifically approved in writing by the authorized officer of the Federal surface management agency.

Archaeology (Category 2, 2,040 Acres). The Nine Mile Canyon area is within the Nine Mile Archaeological District, which was nominated to the National Register of Historic Places in 1974. These lands, 2,040 acres, are recommended for category 2:

Township 11 South, Range 14 East, Sec. 25: S $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 26: S $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$.

Township 11 South, Range 15 East, Sec. 30: SW $\frac{1}{4}$ SE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 31: SW $\frac{1}{4}$ SW $\frac{1}{4}$, N $\frac{1}{2}$, N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 33: S $\frac{1}{2}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$.

Township 11 South, Range 17 East, Sec. 28: S $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 29: S $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 31: NW $\frac{1}{4}$, W $\frac{1}{2}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 33: N $\frac{1}{2}$, N $\frac{1}{2}$ SW $\frac{1}{4}$.

Stipulations:

- The Federal surface management agency is responsible for determining the presence of cultural resources and specifying mitigation measures required to protect them. Prior to undertaking any surface-disturbing activity on the lands covered by this lease the lessee/operator, unless notified to the contrary by the authorized officer of the surface management agency, shall:
- Engage the services of a qualified cultural resource specialist acceptable to the surface management agency to conduct an intensive inventory for evidence of cultural resource values;
- Submit a report acceptable to the authorized officer of the surface management agency; and
- Implement such mitigation measures as required by the authorized officer of the surface management agency to preserve or avoid destruction of inventoried cultural resource values. Mitigation may include

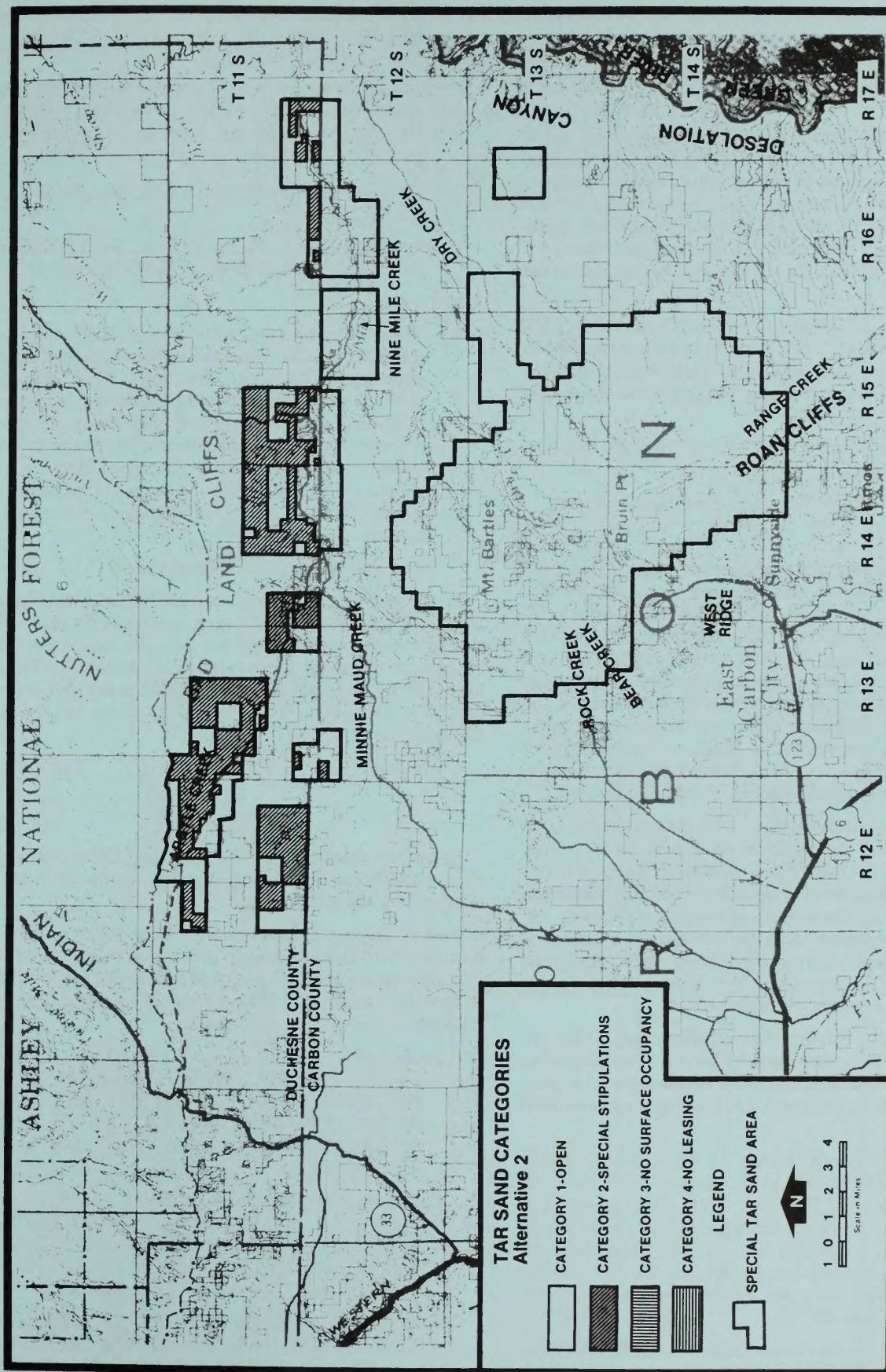


FIGURE 2-34
ALTERNATIVE 2, SUNNYSIDE STSA (NORTHERN PORTION)

CHAP 2: ALTERNATIVE EVALUATIONS

relocation of proposed facilities, testing and salvage, or other protective measures deemed necessary. All costs of the inventory and mitigation shall be borne by the lessee/operator and all data and materials salvaged shall remain under the jurisdiction of the U.S. Government.

- The lessee/operator shall immediately bring to the attention of the authorized officer of the Federal surface management agency any cultural and paleontological resources, or other objects of scientific interest discovered by surface or subsurface operations under this lease and shall leave such discoveries intact until directed to proceed by the authorized officer.

Threatened or Endangered Species (Category 2, 3,520 Acres). Approximately 3,520 acres have been identified as potential habitat for the Uinta Basin hookless cactus, *Sclerocactus glaucus*. The areas listed below are recommended for category 2:

Township 11 South, Range 14 East, Sec. 22: E $\frac{1}{2}$; Sec. 23 & 24: All.

Township 11 South, Range 15 East, Sec. 19-21: All.

Stipulations:

- The Federal surface management agency is responsible for assuring that the area to be disturbed is examined prior to undertaking any surface-disturbing activities on lands covered by this lease. This examination shall determine effects upon any plant or animal species, listed or proposed for listing as endangered or threatened or their habitats. If the findings of this examination determine that the operation may detrimentally affect an endangered or threatened species, some restrictions to the operator's plans or disallowances of use may result.
- The lessee/operator may, at his discretion and cost, conduct the examination on the lands to be disturbed. This examination must be done by or under the supervision of a qualified resource specialist approved by the surface management agency. An acceptable report must be provided to the surface management agency identifying the anticipated effects of the proposed action on endangered or threatened species or their habitat.

Visual Resources (Category 2, 11,920 Acres). There are scenic Federal lands designated Class II (considered as areas of high visual sensitivity) which require special stipulations. These lands, approximately 11,920 acres, are defined as follows:

Township 11 South, Range 12 East, Sec. 7: NE $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 8: N $\frac{1}{2}$; Sec. 10: N $\frac{1}{2}$, W $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 11: NW $\frac{1}{4}$ NW $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$; Sec. 12: S $\frac{1}{2}$ S $\frac{1}{2}$; Sec. 13: N $\frac{1}{2}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 14: NE $\frac{1}{4}$ NE $\frac{1}{4}$; Sec. 15: NE $\frac{1}{4}$; Sec. 26: W $\frac{1}{2}$; Sec. 27: All; Sec. 28: NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 29: All; Sec. 34: W $\frac{1}{2}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$ NE $\frac{1}{4}$, W $\frac{1}{2}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 35: All.

Township 11 South, Range 13 East, Sec. 7: SW $\frac{1}{4}$ SW $\frac{1}{4}$; Sec. 17: SW $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 18: S $\frac{1}{2}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 20: N $\frac{1}{2}$; Sec. 25: S $\frac{1}{2}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$ NE $\frac{1}{4}$, W $\frac{1}{2}$, N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 31: N $\frac{1}{2}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$.

Township 11 South, Range 14 East, Sec. 27: S $\frac{1}{2}$; Sec. 30: SE $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$; Sec. 31: NE $\frac{1}{4}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 33: SE $\frac{1}{4}$; Sec. 34: N $\frac{1}{2}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$.

Township 11 South, Range 15 East, Sec. 28: S $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$; Sec. 29: SE $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 30: All; Sec. 31: N $\frac{1}{2}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 33: N $\frac{1}{2}$, N $\frac{1}{2}$ SE $\frac{1}{4}$.

Township 11 South, Range 16 East, Sec. 34: S $\frac{1}{2}$; Sec. 35: S $\frac{1}{2}$.

Township 11 South, Range 17 East, Sec. 28: S $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 31: S $\frac{1}{2}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 33: W $\frac{1}{2}$.

Stipulation:

- These areas have been identified as having high aesthetic values and visual sensitivity requiring special protection. Therefore, locations of all long-term permanent facilities should be selected to conform to natural surroundings and color tones on all permanent and semi-permanent structures and facilities must blend with natural surroundings. Both requirements will be subject to final approval by the authorizing officer of the Federal surface management agency.

Alternative 3, Restricted Development

This alternative is similar in scope to the other alternatives, but ultimately places more emphasis on protecting the renewable resource values and the existing surface environment through more restrictive stipulations. The following lists categories and approximate acres and percent of area in each. (Figure 2-35 shows locations of proposed categories.)

Category	Acres	Percent
1	9,660	29
3	23,412	71

Issues identified include the following: (Note: Acreages do not add because two or more resource categorizations overlap in some locations.)

Soils (Category 3, 15,120 Acres). Soils with high erosion hazard would require special protective measures during disturbance to reduce erosion and provide for rehabilitation to restore productivity. Approximately 15,120 acres in the following areas would be involved:

Township 11 South, Range 12 East, Sec. 7: NE $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 8: N $\frac{1}{2}$; Sec. 10: N $\frac{1}{2}$, W $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 11: N $\frac{1}{2}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$; Sec. 12: All; Sec. 13: N $\frac{1}{2}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 26: All; Sec. 27: All; Sec. 28: NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 29: All; Sec. 33-35: All;

East, Sec. 6 & 7: All; Sec. 8: N $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 9 & 10: All; Sec. 15: All; Sec. 17: All; Sec. 18: NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 20: N $\frac{1}{2}$; Sec. 21: N $\frac{1}{2}$, S $\frac{1}{2}$ SW $\frac{1}{4}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 22: All; Sec. 25: N $\frac{1}{2}$, SW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 31: N $\frac{1}{2}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$.

Township 11 South, Range 14 East, Sec. 21: E $\frac{1}{2}$; Sec. 22: SW $\frac{1}{4}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$; Sec. 27: W $\frac{1}{2}$; Sec. 28: E $\frac{1}{2}$; Sec. 30: N $\frac{1}{2}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$; Sec. 31: NE $\frac{1}{4}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$, S $\frac{1}{2}$.

Stipulation:

- No surface occupancy or other activity on the sur-

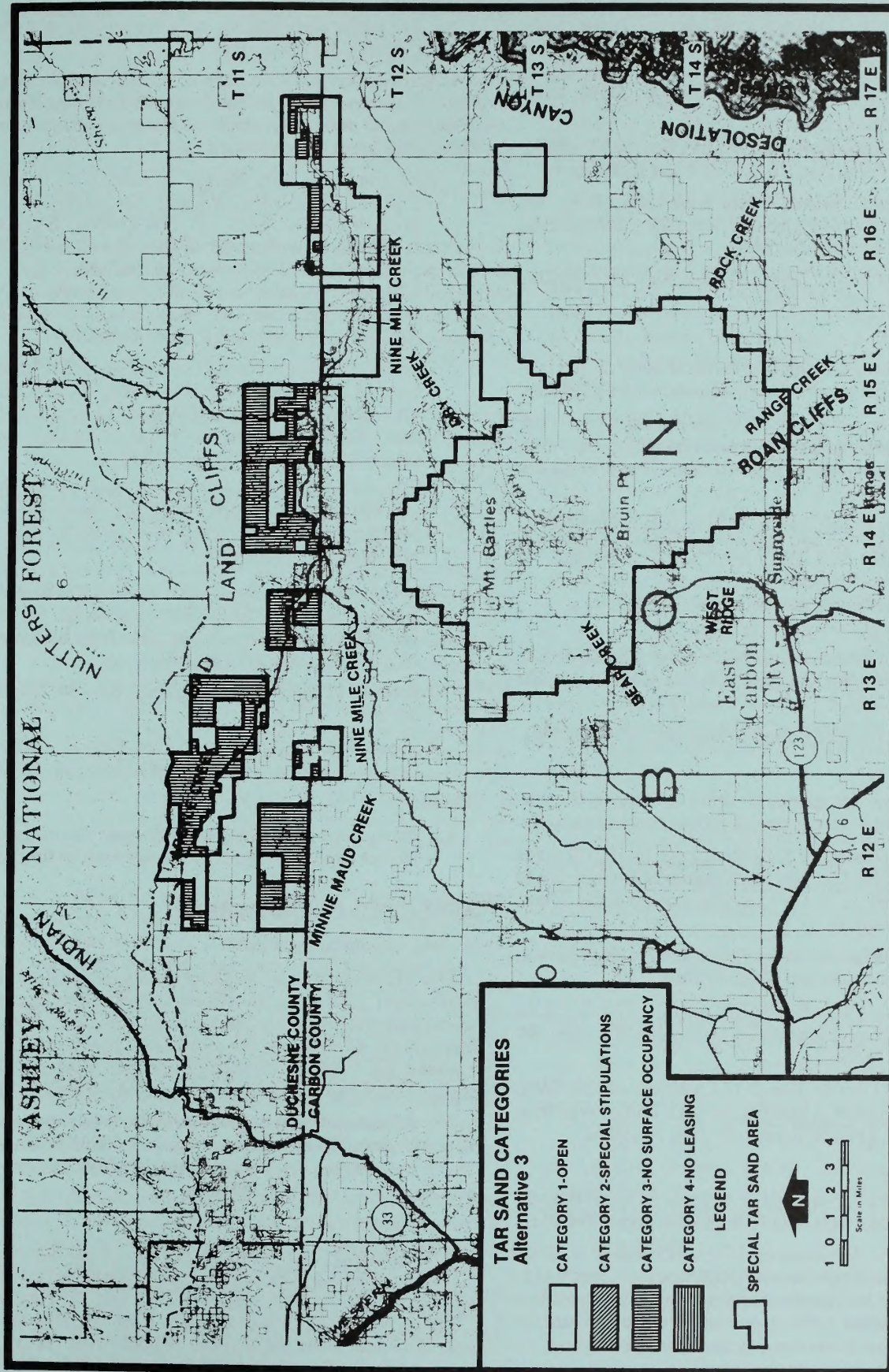


FIGURE 2-35
ALTERNATIVE 3, SUNNYSIDE STSA (NORTHERN PORTION)

CHAP 2: ALTERNATIVE EVALUATIONS

face of (legal description) is allowed under this lease.

Water Resources (Category 3, 920 Acres). Those public lands defined as wetlands or floodplains within the STSA (approximately 920 acres), shall be considered as having special characteristics requiring protection. These lands are described as:

Township 11 South, Range 12 East, Sec. 8: NE $\frac{1}{4}$ NE $\frac{1}{4}$;
Sec. 10: NW $\frac{1}{4}$; Sec. 13: SW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ NW $\frac{1}{4}$;

Township 11 South, Range 13 East, Sec. 18:
SE $\frac{1}{4}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 20: SW $\frac{1}{4}$ NE $\frac{1}{4}$,
NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 25: SW $\frac{1}{4}$.

Township 11 South, Range 17 East, Sec. 31: S $\frac{1}{2}$ SW $\frac{1}{4}$,
SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 33: NW $\frac{1}{4}$.

Stipulation:

- No surface occupancy or other activity on the surface of (legal description) is allowed under this lease.

Water Resources (Category 3, 1,080 Acres). Those Federal lands (approximately 1,080 acres) containing important springs would require special protection. These lands are described as:

Township 11 South, Range 12 East, Sec. 8: NE $\frac{1}{4}$ NW $\frac{1}{4}$,
S $\frac{1}{2}$ N $\frac{1}{2}$; Sec. 12: NE $\frac{1}{4}$ SW $\frac{1}{4}$; Sec. 26: W $\frac{1}{2}$; Sec. 27:
NE $\frac{1}{4}$ NE $\frac{1}{4}$.

Township 11 South, Range 13 East, Sec. 7:
NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 22: W $\frac{1}{2}$ NE $\frac{1}{4}$.

Township 11 South, Range 14 East, Sec. 22: NE $\frac{1}{4}$ NE $\frac{1}{4}$,
NW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 23: SE $\frac{1}{4}$ NE $\frac{1}{4}$, SW $\frac{1}{4}$ NW $\frac{1}{4}$; Sec. 33:
S $\frac{1}{2}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$.

Township 11 South, Range 16 East, Sec. 33: SE $\frac{1}{4}$ SW $\frac{1}{4}$.

Stipulation:

- No surface occupancy or other activity on the surface of (legal description) is allowed under this lease.

Archaeology (Category 3, 2,040 Acres). The 2,040 acres within the Nine Mile Canyon Archaeological District would be recommended as closed to surface occupancy. These lands are described as:

Township 11 South, Range 14 East, Sec. 25: S $\frac{1}{2}$ SW $\frac{1}{4}$,
S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 26: S $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$.

Township 11 South, Range 15 East, Sec. 30: SW $\frac{1}{4}$ SE $\frac{1}{4}$,
S $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 31: SW $\frac{1}{4}$ SW $\frac{1}{4}$, N $\frac{1}{2}$, N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 33:
S $\frac{1}{2}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$.

Township 11 South, Range 17 East, Sec. 28: S $\frac{1}{2}$ SW $\frac{1}{4}$;
Sec. 29: S $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 31: NW $\frac{1}{4}$, W $\frac{1}{2}$ NE $\frac{1}{4}$,
S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 33: N $\frac{1}{2}$, N $\frac{1}{2}$ SW $\frac{1}{4}$.

Stipulation:

- No surface occupancy or other activity on the surface of (legal description) is allowed under this lease.

Threatened or Endangered Plants (Category 3, 3,520 Acres). The areas (approximately 3,520 acres) identified as potential habitat for the threatened Uinta Basin hookless cactus *Sclerocactus glaucus*, would be closed to surface occupancy. These areas are described as follows:

Township 11 South, Range 14 East, Sec. 22: E $\frac{1}{2}$; Sec.
23 & 24: All.

Township 11 South, Range 15 East, Sec. 19-21: All.

Stipulation:

- No surface occupancy or other surface activity is allowed under this lease.

Visual Resources (Category 3, 11,920 Acres). Scenic Federal lands within the STSA designated as Class II (areas of high visual sensitivity) shall require special stipulations. The 11,920 acres are described as:

Township 11 South, Range 12 East, Sec. 7: NE $\frac{1}{4}$,
E $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 8: N $\frac{1}{2}$; Sec. 10:
N $\frac{1}{2}$, W $\frac{1}{2}$ SW $\frac{1}{4}$; Sec. 11: NW $\frac{1}{4}$ NW $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$,
N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$; Sec. 12: S $\frac{1}{2}$ S $\frac{1}{2}$; Sec. 13: N $\frac{1}{2}$ NE $\frac{1}{4}$,
SW $\frac{1}{4}$ NE $\frac{1}{4}$, N $\frac{1}{2}$ NW $\frac{1}{4}$; Sec. 14: NE $\frac{1}{4}$ NE $\frac{1}{4}$; Sec. 15:
NE $\frac{1}{4}$; Sec. 26: W $\frac{1}{2}$; Sec. 27: All; Sec. 28: NW $\frac{1}{4}$ NW $\frac{1}{4}$;
Sec. 29: All; Sec. 32: All; Sec. 34: W $\frac{1}{2}$ NE $\frac{1}{4}$,
SE $\frac{1}{4}$ NE $\frac{1}{4}$, W $\frac{1}{2}$, NE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 35: All.

Township 11 South, Range 13 East, Sec. 7: SW $\frac{1}{4}$ SW $\frac{1}{4}$;
Sec. 17: SW $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, SW $\frac{1}{4}$, W $\frac{1}{2}$ SE $\frac{1}{4}$; Sec.
18: S $\frac{1}{2}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ NW $\frac{1}{4}$, E $\frac{1}{2}$ SW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$;
Sec. 20: N $\frac{1}{2}$; Sec. 25: S $\frac{1}{2}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$ NE $\frac{1}{4}$, W $\frac{1}{2}$,
N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 31: N $\frac{1}{2}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$.

Township 11 South, Range 14 East, Sec. 27: S $\frac{1}{2}$; Sec.
30: SE $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ NW $\frac{1}{4}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, SE $\frac{1}{4}$; Sec. 31:
NE $\frac{1}{4}$ NE $\frac{1}{4}$, NW $\frac{1}{4}$, N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 33: SE $\frac{1}{4}$; Sec. 34:
N $\frac{1}{2}$, N $\frac{1}{2}$ SW $\frac{1}{4}$, NW $\frac{1}{4}$ SE $\frac{1}{4}$.

Township 11 South, Range 15 East, Sec. 28: S $\frac{1}{2}$ NW $\frac{1}{4}$,
SW $\frac{1}{4}$; Sec. 29: SE $\frac{1}{4}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SE $\frac{1}{4}$,
NE $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 30: All; Sec. 31: N $\frac{1}{2}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$,
N $\frac{1}{2}$ SE $\frac{1}{4}$; Sec. 33: N $\frac{1}{2}$, N $\frac{1}{2}$ SE $\frac{1}{4}$.

Township 11 South, Range 16 East, Sec. 34: S $\frac{1}{2}$; Sec.
35: S $\frac{1}{2}$.

Township 11 South, Range 17 East, Sec. 28: S $\frac{1}{2}$ SW $\frac{1}{4}$;
Sec. 31: S $\frac{1}{2}$ NE $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$; Sec. 33: W $\frac{1}{2}$.

Stipulation:

- No surface occupancy or other activity on the surface of (legal description) is allowed under this lease.

AFFECTED ENVIRONMENT

Air Quality and Climate

The STSA is within a Class II air quality designation. This designation allows for moderate deterioration normally accompanying well-controlled growth. Dinosaur National Monument, 63 miles to the northeast, has been recommended for Class I designation. No major air pollution sources have been identified in the vicinity of this STSA.

Annual precipitation in the Sunnyside area ranges from 10 to 12 inches. Temperatures range from -39°F in winter to 104°F in summer. The June-September frost-free season averages approximately 120 days.

Minerals

TAR SAND: The northern portion of the Sunnyside STSA includes the following tar sand deposits as described by Ritzma (1979): (1) Minnie Maud Creek; (2) Nine Mile Canyon; and (3) a portion of Argyle Canyon. This discussion only addresses those three deposits (the others are discussed in the Sunnyside and Vicinity (Southern Portion) STSA falling within the boundaries of the Diamond Mountain Resource Area.

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Minnie Maud Creek: The Minnie Maud Creek tar sand deposits are located in Townships 11 and 12 South, Ranges 11, 12 and 13 East, in Duchesne and Carbon counties, Utah. The deposits are a group of oil-impregnated outcrops aligned approximately east-west over a distance of about 10 miles, north of Minnie Maud Creek. Ritzma (1979) reports the areal extent of the deposits at 0.5 to 3.5 square miles. The beds in which the deposits occur are the deltaic facies and Parachute Creek member of the Green River formation (Eocene age). The dominant lithology is sandstone and siltstone with limestone (Ritzma, 1979).

The principal oil-impregnated zones are reported to range from 1 to 4 feet, with a gross thickness of pay ranging from 5 to 15 feet. The overburden thickness is estimated to range from zero at the outcrop to 500 feet or more at 0.25 mile from the outcrop. The deposit is ranked as large and is estimated to contain 10 to 15 million barrels of in-place oil (Ritzma, 1979).

Argyle Canyon: The eastern portion of the Argyle Canyon tar sand deposits included in this STSA is located in Township 11 South, Range 12-13 East, Duchesne County, Utah. The deposits crop out in Argyle Creek and Dry canyons. The deposits are reported by Ritzma (1979) to occur in sandstone and siltstone with limestone in the deltaic facies, Parachute Creek member, and Evacuation Creek member of the Green River formation. The beds dip north and east with dips ranging from 4° to 6° (Covington, 1964). Ritzma (1979) reports 3 to 5 principal pay zones with a gross thickness of pay of 15 to 60 feet. The asphaltic sandstone has been marketed under the trade name of "Argulite" and contains 8- to 10-percent bitumen by weight (Covington, 1963). Two samples of extracted oil showed a sulfur content ranging from 0.25 to 0.35, averaging 0.30 (Ritzma, 1979). Overburden is estimated by Ritzma (1979) to range from zero at the outcrop to 500 feet or more at 0.25 mile from the outcrop. Ritzma (1979) ranks the deposits as large and estimates 50 to 70 million barrels of in-place oil. There is a lack of published data on the details of the deposits.

Nine Mile Canyon: The Nine Mile Canyon tar sand deposits are located in Township 11 South, Range 14-17 East, in Duchesne and Carbon counties, Utah. The deposits are discontinuous outcrops of oil-impregnated sandstone and siltstone in the deltaic facies and Parachute Creek member of the Green River formation. The outcrops occur along Nine Mile Creek, Gate Canyon, Pete's Canyon, Currant Canyon, and Parley Canyon. The discontinuous outcrops extend over a distance of about 17 miles. Ritzma (1979) ranks the deposits as small to medium with an estimated 5 to 10 million barrels of in-place oil. There is a lack of published data on the details of the deposits; therefore, development technologies are not known.

OIL AND GAS: Approximately 25 percent of the Sunnyside STSA remains unleased for oil and gas. Occurrences are similar to those in Argyle Canyon, with high viscosities and tar-like qualities of the bitumen making it unattractive for commercial development. There is no current oil and gas production in the northern portion of the Sunnyside STSA, although there is oil and gas production in the Carbon County portion of the STSA.

SALEABLE MINERALS: The area receives moderate use for the collection and purchase of building stone. Because of exfoliation and subsequent weathering, south-

facing ridges along Nine Mile Creek have produced stone that fractures in thin sheets, making it suitable for facing stone. Long-haul distances have discouraged large-scale commercial operations, but the area still remains important for residents of Duchesne and Uintah counties. No significant sand and gravel deposits occur within or near this portion of the STSA. Extraction is limited to use by residents of the area and Duchesne County for routine road maintenance.

LOCATABLE MINERALS: Prospect pits within and adjacent to the northern portion of the Sunnyside STSA would suggest the area has been explored, but no significant mineral occurrence eligible for location under the 1872 Mining Laws have been recorded. The only exception would be the pre-1920 oil placer claims located in Township 11 South, Range 12 East, Sec. 7, 8, 9, 10, and 11. These claims have not been examined by BLM to establish their validity.

Geology and Topography

The STSA is located on the southwest limb of the Uinta Basin. The structure is essentially homoclinal; the rocks dip 3° to 10° to the northeast in the Uinta Basin. The Wasatch formation, of Lower Eocene age, contains the bulk of the bituminous sandstone deposits and makes up most of the steep face of the Roan Cliffs. The formation is 3,750 feet thick in the Sunnyside quadrangle, but only the uppermost one-third contains bituminous sandstone beds.

The topography of the STSA is rugged with numerous drainages containing steep canyon walls which exceed 100-class percent slope. The general drainage pattern is from west to east where Nine Mile Canyon empties into the Green River. Elevations range from 9,300 feet on the northwestern portion of the STSA to 5,200 feet along Nine Mile Canyon.

Soils

The major soils are Blazon, Rencot, and badland making up about 65 percent of the area. The remaining 35 percent are minor soils and rock outcrop. Blazon soils are very shallow and well drained with a gravelly clay loam surface layer. The underlying layers are a mixture of clay loam and silty clay loam resting on hard shale at a depth of about 6 inches. Rencot soils are shallow and well drained with a very gravelly sandy loam surface layer. The underlying layers are very gravelly and extremely gravelly loam. Sandstone occurs at a depth of about 12 inches. Badland is steep and very steep, non-stony land with mostly barren surface that is actively eroding.

Soil productivity is low because steep slopes, shallow soils, and low rainfall (less than 13" per year). Reclamation potential for the area is poor. Those areas with moderate slopes where deeper soils occur would be easier to reclaim; however, low rainfall would be a primary limiting factor.

Vegetation

Riparian vegetation of the floodplain includes cottonwood, willow, tamarisk, greasewood, saltgrass, and sagebrush. The remaining vegetation varies from short-shrub types to alpine fir and aspen.

This STSA contains habitat for the Federally endangered plant species *Sclerocactus glaucus* (Unita Basin hookless cactus). The cactus has been found on south-facing, gravelly surfaced alluvial fans as well as flat gravelly areas along

CHAP 2: ALTERNATIVE EVALUATIONS

the Wrinkles Road area. The habitat falls within the low-desert shrub community, which makes up dominant vegetation cover. This community is quite similar to the one described for Pariette STSA; however, pygmy sage sub-communities exist on the very shallow soils. no other threatened and endangered plant species are known to exist within this STSA.

Livestock Grazing and Agriculture

Although areas along Nine Mile Creek are farmed, none are under BLM jurisdiction. Eight permittees graze cattle (805 AUMs) on seven allotments which partially overlap this STSA. Table 2-18 shows the status of livestock grazing within the STSA.

Several springs and seeps are found within the STSA. None of these are designated public water reserves. All are important water sources because they disperse cattle from Nine Mile Creek. BLM has diligence claims to the water from eight springs in the STSA. Flow from each spring was estimated at 1-2 gallons per minute; no water quality data are available.

The only floodplain in the STSA is found along Nine Mile Creek, a perennial stream with no streamflow discharge records. Eroded streambanks indicate high flow during snowmelt and after intense thundershowers. The only wetlands occur along Nine Mile Creek within the floodplain.

Wildlife

BIG GAME: The Sunnyside STSA provides limited winter range for mule deer as well as a small amount of yearlong range in the Nine Mile Creek area. Nine Mile Canyon has been proposed for a desert bighorn sheep introduction in the future. If introduced, the sheep would use the steep, rocky slopes of the canyon in and around the STSA.

UPLAND GAME: The STSA contains a large number of cottontail rabbits and a small number of chukars.

NON-GAME SPECIES: A variety of non-game species are present in the STSA, including coyotes and golden-mantled ground squirrels. A number of raptor species are also present in the STSA, including marsh hawk, red-tailed hawk, prairie falcon and American kestrel, all of which nest in the area. The golden eagle is a frequent visitor to the area; however, no nests have been located. Bald eagles are an uncommon winter visitor. Rough-legged hawk and merlin are uncommon visitors in canyons.

Visual Resources

This area consists of VRM Class II (11,920 acres) and IV (21,152 acres) lands. The more scenic areas (II) are rated A (high) because of the variety of landforms and dramatic erosional patterns. These areas are within the foreground-middleground zone of the travel corridors. Archaeological rock art adds to the uniqueness of the area. Areas more removed from the travel corridors with less scenic landscape (C) are classified as IV.

Landform in Class II areas is rugged, typified by canyons, with some variation of color in exposed rocks. Color variations include tans and muted reds and grey-greens, with a vegetative overstory of pinyon-juniper and sage. VRM class IV allows changes that could become dominant features; however, they should repeat the form, line, color and texture found in the characteristic landscape.

Cultural Resources

Nine Mile Canyon has been a focus of professional archaeological interest. A survey of the western portion of the canyon was conducted in the 1970s. Professional interest has generated reports since the 1940s. Nine Mile Canyon and its main tributaries and upland benches are thickly populated with rock art sites, caves, camps, resource utilization sites, and prehistoric and historic structures. The canyon area was nominated to the National Register of Historic Places in 1974. Interest has focused on rock art sites which are abundant and varied. Formative period cultures such as the Fremont and Anasazi have been identified. Rock art remains are of archaic-period peoples. Graves, ceremonial, agricultural, and residential sites are reputed to be located in the canyons. To date, there has not been class II sampling efforts in or near the canyon.

Recreation

No developed recreation sites exist in this area. Hunting activity is primarily for deer. Opportunities exist for geologic sightseeing and viewing rock art. Little ORV use is apparent.

Land Use Plan

Only one right-of-way traverses the STSA. It is for a buried pipeline. In addition, several county roads cross parts of the area. Both Uintah and Duchesne counties have zoning ordinances that regulate development.

Wilderness

No WSAs have been identified in this area.

Socioeconomics

The affected areas would include Carbon and Duchesne counties. Wellington and Price would be the most heavily impacted communities in Carbon County, while Myton, Roosevelt, Bridgeland, and Duchesne would be impacted to a lesser degree in Duchesne County.

In Carbon County, growth has been linked to the coal industry which expanded rapidly and then declined following the national recession. Currently, construction and operation of nearby electrical generating plants is providing a large share of employment in the area. In Duchesne County, growth has been linked to the oil and gas industry. It has expanded and declined with oil well drilling activity. The communities in both Carbon and Duchesne counties have experienced the usual infrastructure and social service problems associated with rapid growth. If rapid development occurred, the sewer systems in Price, Wellington, and Roosevelt would require major investments. Municipal water supplies would also have to be expanded as well as fire, police, school, and hospital services.

Utah Senate Bill 170 allows developers to mitigate fiscal impacts through sales and property tax prepayments. Both Carbon and Duchesne county regulations require county approval of a development before it is given permits to proceed with construction. The counties would, therefore, have some control over the developer's mitigation of any local socioeconomic impacts present or anticipated at the time construction began. However, this is not true for the Uintah and Ouray Indian Reservation. It is not covered by the provisions in Utah Senate Bill 170; therefore, the Reservation would not be covered by any mitigation agreed to by the counties.

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TABLE 2-18

Livestock Grazing Data
for Sunnyside STSA (Northern Portion)

Allotment	Class of Livestock	Season of Use	Federal AUMs Within the STSA	Percent of Allotment ^a
Parley's Canyon	Cattle	4/01-6/15	88	19
Currant Canyon	Cattle	11/01-4/30	68	28
Five Mile	Cattle	11/01-4/30	60	8
Water Canyon 2	Cattle	11/-1-4/30	42	30
Devils Canyon	Cattle	11/01-4/30	159	12
Bull Canyon	Cattle	11/01-4/30	68	7
Leers Canyon	Cattle	4/16-6/15	215	36
Argyle Ridge	Cattle	5/16-11/15	105	19

^aPercent of allotment within the STSA.

PUBLIC ATTITUDES: Generally, people in both Carbon and Duchesne counties support well-planned growth. The Ute Indian people are not opposed to energy development as long as it is well organized and appropriate mitigation is implemented to insure that their lifestyles are protected. The Ute Indians also require training that would enable them to obtain and hold jobs in the tar sand industry.

ENVIRONMENTAL CONSEQUENCES

Oil and Gas and Tar Sand

The northern portion of the Sunnyside STSA has low demonstrated potential for oil and gas recovery; there has been little interest shown in the tar sand resource.

ALTERNATIVE 1, NO ACTION/DEVELOPMENT: This alternative would allow for maximum exploration and development and would provide the least amount of protection to renewable resource values. Open leasing would allow for the extensive surface occupancy on 33,072 acres within the STSA.

ALTERNATIVE 2, MULTIPLE USE (PREFERRED) ALTERNATIVE: Within the STSA there are six areas of concern; highly erodible soils, wetlands and floodplains, springs and seeps, archaeology, threatened and endangered plant species, and visual resources. These all require special protection or seasonal restrictions. Category 2 areas would encompass 71 percent (23,412 acres) of the Federal lands available for leasing under this alternative. However, the recommended stipulations would still allow exploration and development to take place while protecting special resource values. The remaining 9,660 acres would be open to leasing under category 1. This alternative would provide the least restrictive stipulations while protecting the existing environment and allowing optimum development of mineral resource values.

ALTERNATIVE 3, RESTRICTED DEVELOPMENT: As discussed under Alternative 2, the area of special concern encompass 71 percent of the Federal land. By placing all of these areas into category 3, there would be no technologically feasible method to extract the mineral resources; however, the remaining 29 percent of the STSA would be available for leasing.

Other Minerals

That portion of the STSA lying within Duchesne County has no known significant locatable or saleable mineral deposits. Thus, there would be no impacts to other minerals from any of the alternatives in this proposal.

Other Resource Values

AIR QUALITY: Many of the problems (i.e., wind-blown particulates) would be similar to surface mining of coal. Additionally, surface extraction processing (hot water, solvents, and surface retorting) would require the introduction of heat. These boilers or furnaces would probably be fired by residual oil or coal and would result in emissions of SO₂, NO, NO₂, and particulate matter. Removal of any ash, coke, waste water, or other materials would require adequate controls. In-situ technologies would also result in air quality impacts. Both the steam-drive and fire-flooding processes burn coal or the produced crude to operate the engines driving the steam generators or air compressors. The combustion process results in the production of SO₂ and particulate matter and the formation of NO and NO₂.

Analysis of detailed air quality impacts are largely beyond the scope of this EIS and would be addressed in detail in plans of operation. Air quality impacts are addressed in detail in the Volume I of this EIS and in the Combined Hydrocarbon Sunnyside EIS.

GEOLOGY AND TOPOGRAPHY: If surface mining were to occur in the area, it would irreparably alter existing topographical features. These features (ridgetops and drainages) could be lost as a result of overburden removal or filling by waste disposal. Reclaiming to original contours or blending reclaimed areas with adjacent undisturbed areas would be highly unlikely. In-situ development would not result in these major impacts to topography; however, a few feet of subsidence could occur.

Alternative 1, No Action/Development: All of the above-mentioned impacts would be expected to occur. However, the amount of disturbance would depend on the amount and location of development.

Alternative 2, Multiple Use (Preferred Alternative): Approximately 15,120 acres (slopes in excess of 40 percent) could not be occupied without written permission of BLM. Approximately 1,080 acres (floodplains and water sources) would not be occupied. Thus, the impacts described above would not occur there.

Alternative 3, Restricted Development: Under this alternative, 23,412 acres would be subject to no surface occupancy. Thus, impacts to topographic features would not occur on this acreage.

SOILS: Erosion could be expected to increase where surface disturbance accompanied oil and gas and tar sand development. There would be removal and respreading of surface soils by surface mining as well as soil disturbance wherever roads, drill pads, building sites, and waste dumps were located.

Alternative 1, No Action/Development: Existing category 1 general stipulations on the entire 33,072 acres could provide protection for the soil resource where favorable soil and landscape conditions exist and surface disturbance was not extensive. These stipulations, however, might not give adequate protection on areas where surface disturbance was extensive (i.e., surface mining) and where unstable soil conditions exist. These conditions include soils with a high or very high erosion hazard, soils on steep and unstable slopes, and soils with wet and saturated conditions. Such conditions could produce excessive on-site wind and water erosion as well as off-site soil and water degradation. The amount of erosion would depend on the area, soil types, soil conditions and extent of development. Off-site degradation could result from undesirable soil deposition by wind or water and increased sediment and salt loads downstream. Sediment and salt load could continue downstream to the Green and Colorado rivers.

Alternative 2, Multiple Use (Preferred Alternative): This alternative would provide access for oil and gas and tar sand development and still protect the soil resource. Soils with high and very high erosion hazard would be protected by special stipulations on 15,120 acres to control accelerated erosion and provide for rehabilitation of disturbed soils. The winter shutdown stipulation during periods of wet and unstable soil conditions would apply. This would protect soils when they are most susceptible to damage and resultant erosion. Occupancy during other periods is not affected by this stipulation. The no surface occupancy stipulation on surface slopes greater than 40 percent, without

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permission of the authorized officer, would apply to all hydrocarbon development. Occupancy could be authorized where proper mitigation was feasible and the need existed.

Alternative 3, Restricted Development: This alternative would preclude development on category 3 areas (15,120 acres) by not allowing surface occupancy. The soil resource would be given maximum protection from accelerated erosion resulting from development.

VEGETATION--THREATENED OR ENDANGERED SPECIES: Surface-disturbing activities associated with oil and gas or tar sand development would include construction of well sites, access roads, supporting facilities, exploration roads, and drill holes. All of these actions would require vegetation and some topsoil removal. Surface mining would cause the greatest site impacts, with complete removal of vegetation and overburden from pit areas. Such activities could destroy existing populations and habitat for the threatened Uintah Basin hookless cactus *Sclerocactus glaucus*. However, this species is protected by statute under the Threatened and Endangered Species Act of 1973, and consultation with the FWS would be necessary under any alternative before hydrocarbon development could occur.

Alternative 1, No Action/Development Alternative: All of the impacts described above could occur.

Alternative 2, Multiple Use (Preferred Alternative): Any surface-disturbing activities would be precluded by threatened and endangered surveys and clearances. If the Uinta Basin hookless cactus were found on any site proposed for disturbance, the development location could be moved or the plant population relocated to a suitable non-affected location.

Alternative 3, Restricted Development Alternative: No surface occupancy would be allowed on 23,412 acres. This would preclude adverse impacts to threatened plants and habitats. Development of any CHL on this habitat would not be allowed.

WATER RESOURCES--WETLANDS AND FLOODPLAINS: Hydrocarbon development could alter wetlands and floodplains through removal of vegetation and soil. This could change drainage patterns and increase sediment production.

Alternative 1, No Action/Development: Oil and gas and tar sand development and production could occur within the STSA with only the general category 1 stipulations. However, additional special stipulations could be imposed to limit surface disturbance and occupancy in the review of APDs, exploration plans, and plans of operation. Otherwise, some degradation of wetlands and floodplains in Argyle Canyon and along Nine Mile Creek could occur.

Alternative 2, Multiple Use (Preferred Alternative): No surface occupancy or disturbance would be allowed within 600 feet of wetlands or floodplains. Other special stipulations which utilize new resource data and recognize the value of renewable resources could be imposed.

Alternative 3, Restricted Development: Stipulating no surface occupancy or other surface disturbance under this alternative would offer the maximum amount of protection to wetlands and floodplains in Argyle Canyon and along Nine Mile Creek.

SPRINGS: Hydrocarbon development, particularly surface mining, could destroy springs by interrupting aquifers and by removal of surface spring developments. Impacts from in-situ development would be less severe than surface mining but could still result in loss or damage through development activities such as roads, drill pads, and support facilities.

Alternative 1, No Action/Development: Oil and gas and tar sand development could occur within the STSA with only general category 1 stipulations. However, additional special stipulations could be imposed in review of APDs, exploration plans, and plans of operation. Although the springs or seeps could probably be avoided, any stipulations might not adequately protect the recharge area or provide for replacement water. Some degradation of these important water sources could occur.

Alternative 2, Multiple Use (Preferred Alternative): No surface occupancy or disturbance would be allowed within 600 feet of live water. Other special stipulations could be imposed to protect other resources. However, these stipulations might not adequately protect the recharge area or provide for replacement water from springs and seeps.

Alternative 3, Restricted Development: Stipulating no surface occupancy or other surface disturbance on 23,412 acres would provide the maximum amount of protection to springs and seeps. However, adequate protection of these important water sources could not be guaranteed, especially to recharge areas.

WILDLIFE: Impacts to wildlife could occur in several different ways: (1) direct loss of habitat from mining, road construction, etc.; (2) reduced quality of habitat where revegetation potential is poor or slow; and (3) secondary impacts from increased human access and disturbance.

Mule deer habitat on the STSA could be impacted through surface disturbance and/or secondary impacts. Most impacts would be to deer winter range with lesser impacts to yearlong deer range along Nine Mile Creek. Surface disturbance could result in a loss of cottontail rabbit habitat and a net loss in cottontail rabbits. Chukars would be permanently displaced from the area of disturbance. Raptors within the STSA would be reduced in numbers and habitat lost, depending upon the extent of hydrocarbon development. Very little impact is expected to wintering bald eagles, as the STSA does not provide any concentrated use areas for this species. Other non-game wildlife which use the STSA during all or parts of their life cycle would be lost or permanently displaced by surface-disturbing activities.

Alternative 1, No Action/Development: All of the above-mentioned impacts would occur.

Alternative 2, Multiple Use (Preferred Alternative): All of the above-mentioned impacts could occur except for the 15,120 acres where development would be precluded on slopes in excess of 40 percent and the 2,000 acres where surface occupancy would not be allowed within 600 feet of live water and floodplains.

Alternative 3, Restricted Development: The no surface occupancy stipulation imposed on 23,412 acres under this alternative would significantly reduce impacts to wildlife.

LIVESTOCK AND AGRICULTURE: Depending

CHAP 2: ALTERNATIVE EVALUATIONS

on the amount of surface disturbance, six of the eight allotments could be significantly affected by tar sand development, with reductions of more than 10 percent of the available grazing capacity. Two allotments would not be significantly impacted. Livestock operators on six allotments could realize substantial economic hardship by a reduction in AUMs following extensive vegetation removal. Range improvements such as fences and cattleguards and water sources on spring allotments could be removed or substantially altered, affecting livestock management strategies. The effect of surface disturbance associated with hydrocarbon development could reduce the amount of forage available for an extended period until successfully revegetated.

Alternative 1, No Action Development: All of the above-mentioned impacts could occur.

Alternative 2, Multiple Use (Preferred Alternative): Impacts mentioned above would occur in category 1 areas (9,660 acres). In category 2 areas, where no surface occupancy would be allowed on slopes in excess of 40 percent (15,120 acres), impacts would not occur. Impacts mentioned above could occur on the remaining 17,952 acres.

Alternative 3, Restricted Development: This alternative would preclude surface occupancy on 23,412 acres. This would significantly reduce impacts to the livestock operations.

VISUAL RESOURCES: Impacts would be dependent on the extent of development and the extraction methods employed. It is anticipated that any surface mining would cause significantly more visual contrast than either in-situ or conventional oil and gas development. The major contrasts introduced into the characteristic landscape could include surface mining, vegetation removal, road construction, overburden stockpiling, support facilities, and buildings. These unnatural-appearing facilities and landform modifications would detract from the existing high quality visual resource.

Alternative 1, No Action/Development: The original oil and gas category system did not provide for tar sand development; therefore, tar sand activity under this category would result in major adverse impacts as described above. VRM Class II objectives would not be achieved.

Alternative 2, Multiple Use (Preferred Alternative): This alternative would optimize mineral development activity while minimizing scenic quality degradation. Category 2 stipulations on 11,920 acres would address landform modifications, structures, and vegetation. Special attention would be directed toward locating facilities out of line-of-sight of major travel corridors or areas of high visual concern. Structures would be painted to reduce reflectivity and achieve maximum concealment (i.e., a color to blend with the surrounding landscape). Prescribed removal of vegetation, would, insofar as feasible, achieve natural-appearing clearings. Only that vegetation in essential development areas would be removed. Class II could be met in the category 2 areas.

Alternative 3, Restrictive Development: This category would preclude hydrocarbon development on 23,412 acres, thus protecting the visual resource. Class II VRM objectives would be achieved.

CULTURAL RESOURCES: Hydrocarbon development could result in various types of activities which would impact archaeological values. These include (1) surface mining; (2) construction of drill pads and support facilities; (3) rights-of-way for pipelines and powerlines; and (4) waste disposal. Secondary impacts could be expected through vandalism and increased human activities.

Prior to entry upon the land or surface disturbance for mining, drilling, or other purposes, the lessee shall be required to submit for approval an APD, exploration plan, or plan of operation which shall contain the methods and actions proposed for cultural resource protection and clearance. This will be in accordance with 36 CFR 800 and BLM Manual 8100. This would apply under any alternative.

Alternative 1, No Action/Development Alternative: Nine Mile Canyon is a sensitive archaeological area, and the existing category 1 (open to leasing) does not call alert potential lessees to this fact. CHLs could be highly destructive to archaeological sites. Normal mitigation for these resources is avoidance or salvage. Large-scale development activities would preclude the former, and salvage would be the only option. Secondary impacts such as vandalism could not be avoided.

Alternative 2, Multiple Use (Preferred Alternative): The difference between this alternative and Alternative 1 is that potential lessees would be made aware that Nine Mile Canyon (2,040 acres) is a sensitive archaeological area and more specific protective stipulations would be imposed prior to leasing. The special stipulations would be applied to site-specific situations, depending on the results of the required inventories and clearances.

Alternative 3, Restricted Development Alternative: The no surface occupancy stipulation on 23,412 acres would provide the protection necessary to protect all lands characterized as potentially valuable for cultural resources.

RECREATION: Impacts to recreational values could occur from: (1) disturbance to sightseeing features as a result of surface mining; (2) impairment of recreational experience by the physical presence of mines, buildings, tanks, etc.; and (3) secondary impacts from an increase of construction and mine employees (i.e., vandalism, removal of cultural resources, and poaching of wildlife). Adverse impacts could also occur to deer hunting and ORV use from surface disturbance and increased human activity.

Alternative 1, No Action/Development: This alternative would allow hydrocarbon development on the entire 33,072 acres of the STSA. All of the above-mentioned impacts could occur.

Alternative 2, Multiple Use (Preferred Alternative): This alternative would place 71 percent (23,412 acres) of the STSA in category 2 and would include special stipulations to reduce surface disturbance and protect archaeological resources. Areas having high aesthetic values and visual sensitivity are also afforded protection; therefore, impacts to these resources would be less severe than under Alternative 1. With any increase of human activity, adverse impacts to wildlife would be expected largely from harassment and poaching. Also, additional pressure on game species would occur during authorized seasons. This would reduce the quality of hunting. Adverse impacts to ORV use would be

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less under this alternative, depending on the exact acreages and locations developed.

Alternative 3, Restricted Development: Impacts would be similar to those described under Alternative 2, with hydro-carbon development occurring on 9,660 acres.

LAND USES AND LAND USE PLANS: The existing pipeline right-of-way and public roads could be severely impacted from tar sand development. Surface mining would obliterate the pipeline and roads, while in-situ development could avoid physical disturbance of many of the improvements. Any development of tar sand would require many additional rights-of-way. Reconstruction of the existing pipeline and roads could be required in some areas.

Alternative 1, No Action/Development: This alternative would have the highest potential for conflict with existing rights-of-way. All impacts described above could occur.

Alternative 2, Multiple Use (Preferred Alternative): This alternative would have similar although slightly less, impacts when compared to Alternative 1. Even though 71 percent of the STSA is in category 2, development could still occur.

Alternative 3, Restricted Development: Impacts would be substantially less severe. With 71 percent of the STSA in category 3, surface disturbance would be held to a minimum on most of the area. Some road and pipeline reconstruction could be necessary but would be much less than with Alternatives 1 and 2.

SOCIOECONOMICS: Carbon and Duchesne counties would be most heavily impacted by development of this STSA. A large part of the construction work force would come from outside the two-county area because there are not enough workers available in the Duchesne County area to fill many of the anticipated jobs. More workers would be available in the Carbon County area if the current decrease in coal production continues.

It is anticipated that basic services (i.e., sewer and water systems, fire and police protection, schools, and hospitals) could not accommodate the expected increases in populations in either Carbon or Duchesne counties. Many of these impacts could be mitigated through the use of Senate Bill 170 which requires companies to agree to mitigate impacts before construction begins. This is not true for the Ute Indian tribe. The Reservation is not covered by Senate Bill 170; therefore, the Ute tribe would not be covered by any mitigation agreed to by Duchesne County.

Alternatives 1 and 2: All of the above-mentioned impacts would occur.

Alternative 3, Restricted Development: Because the surface would not be disturbed or developed on 71 percent of the STSA, the required work force for construction and operation would be less. Therefore, the socioeconomic impact would not be as severe as Alternatives 1 and 2. However, the exact amount of the change cannot be predicted at this time.

APPENDIX 1

GENERAL POLICY GUIDELINES FOR OIL AND GAS LEASING AND SURFACE DISTURBANCE STIPULATIONS FOR COMBINED HYDROCARBON LEASES

GENERAL POLICY GUIDELINES FOR OIL AND GAS LEASING

The following general policy guidelines have been developed for review of the oil and gas categories. The guidelines form the foundation for a consistent statewide approach to meeting the Bureau's objective of making public lands available for oil and gas leasing while at the same time adequately protecting resource values. Adherence to these guidelines is desirable, but management must fit the specific situation. It is recognized that there are exceptions to any guideline, since it is impossible to include all situations and because there is a wide range in the significance of resource values. These guidelines are not intended to limit the alternatives that can be considered during planning.

Oil and Gas Category Guidelines

1. Unless special or significant other natural resource values are involved, public lands will be in category 1. Standard surface disturbance stipulations which are a part of an oil and gas lease will generally provide adequate protection for the resource values. BLM has the responsibility and the authority to implement additional surface management necessary to protect common resource values when specific proposals for oil and gas development are considered under the operating plan. As an example, study enclosures can normally be protected in this manner.
2. Areas should not be in categories 2, 3 and 4 to protect known or suspected occurrences of other mineral values. Laws and regulations governing multiple mineral development are adequate to allow placing these areas in category 1. If there is considerable disparity of values between mineral resources, conflicts will be handled in the State Office.
3. Generally, areas under wilderness review should be in category 1 with utilization of the wilderness stipulation and Interim Management Policy (IMP) management of wilderness values. However, in cases where an area has values incidental or in addition to wilderness values such as high scenic qualities, wildlife habitat, scientific, educational, historical, ecological or geological values that may be unavoidable and irreparably impacted, an area may logically be placed in categories 2, 3 and 4. However, if the area of concern is being protected primarily for wilderness values, it cannot logically be justified as a cate-

gory 3 or 4 designation in lieu of the policy to allow leasing and exploration in areas under wilderness review.

4. Known geologic structures (KGSs) are to be in categories 1 or 2. Exceptions, such as small recreation sites which fall within a KGS, could be in category 3. Unitized areas are not given any special consideration as to category designation.
5. Cultural values (archaeological and historic) are normally placed in category 1, but known significant values, such as National or State Register sites or sites eligible for inclusion on a register may be in category 2 or 3 if they would be adversely affected by oil and gas related activities. Such values identified after lease issuance can be protected as appropriate through the plans of operation.
6. Paleontological sites of scientific or cultural value are normally included in category 2. However, due to the size of the area or other special circumstances, it may be placed either in categories 1 or 3.
7. Travel influence zones should be in categories 1 or 2 unless they are designated scenic travel areas or have unusual values that could be permanently damaged by access roads or drill pads. In this case they may be in category 3 or 4 to protect the visual corridor.
8. All springs and perennial streams are important for water quality and riparian habitat purposes and are to be protected. Generally, categories 1 and 2 will provide sufficient protection, but depending on size, location, and significance they may need to be in categories 3 or 4.
9. Critical big game winter ranges and fawning areas or other critical habitat areas are to be in category 2 with a seasonal restriction on exploration and drilling activities. However, this does not mean that, just because an area is identified as winter range, it automatically is a category 2 area. Category 2 seasonal limitations are to be applied only where (1) populations and/or habitats are so sensitive or fragile in nature that oil and gas activities may prevent maintenance of existing population levels over an extended period of time, (2) the habitat provides high economic or social value, and (3) where big game and/or habitat requires special management. Certain species such as the desert bighorn sheep may require yearlong habitat protection under categories 3 and 4.

10. Habitat for threatened and endangered (T/E) species and raptor nesting should be placed in category 2 with an appropriate seasonal limitation on surface occupancy when the seasonal occupancy situation is present. If the habitat and/or species is considered to be jeopardized (Unavoidable impacted) at the time of surface occupancy of the lease, authority is provided by the Surface Disturbance Stipulations to adjust the location of well sites, roads, and other facilities. Yearlong habitat areas for T/E species should be in categories 3 and 4. Undefined habitat areas and known habitat for candidate species are to be in category 1 and managed for protection under the open end stipulations. There is no official State list of T/E species.
11. Bald and golden eagle seasonal roost and concentration areas are to be in category 2 with appropriate seasonal restrictions on exploration and drilling activities (or under special circumstances may be placed in category 3 or 4).
12. Known critical and traditional sage grouse strutting and brooding areas and possible other similar critical wildlife and aquatic habitat are to be in category 3. Other general sage grouse or other wildlife areas can be protected by category 2.
13. Municipal watersheds and important lakes and reservoirs may be in category 2, 3, or 4, depending on the size and significance. However, some of these areas were withdrawn by special legislation which may preclude leasing. These should not be included in the category system.
14. Identified floodplains (100-year storm recurrence interval) are to be in either categories 1 or 2 depending on size and significance of floodplain area.
15. All areas of concern that need additional protection and which are less than 1 mile wide are to be in categories 2 or 3, assuming that directional drilling can occur from opposite sides of the area. If directional drilling can occur from only one side, the width limitation is 1/2 mile.
16. Categorization is optional for small tracts, airport leases, recreation and public purposes (R&PP leases, etc. Depending on the individual circumstances (as determined on a case-by-case basis) such areas may be placed in any of the four categories.
17. Wild and scenic study rivers could be categories 3 and 4, depending on the individual circumstances.
18. Designated and proposed research natural areas, recreation sites, and potential areas of critical environmental concern (ACECs) may be in categories 2, 3, or 4, depending on the individual circumstances.
19. In any cases where lands in category 4 are adjacent to lands in categories 1 or 2, the outermost 1/2 mile of the category 4 area is to be placed in category 3. This will decrease the acreage in the no lease category without decreasing protection of surface values.

Special Tar Sand Guidelines

CATEGORY 2

Special stipulations numbers 2 and 4 through 10 can be applied to tar sand leasing and development in the same manner as has been applied to conventional oil and gas leasing. In addition, the following stipulations specific to tar sand operations may be used as category 2 stipulations. Stipulation number 3 will be attached to oil and gas leases issued outside of Special Tar Sand Areas (STSAs) where (1) potential value for tar sand development has been identified, or (2) planning for the area has not been updated to include categorization of tar sand.

- No surface mining of tar sand deposits is allowed on this lease. The tar sand may be extracted by in-situ or underground-mining methods only.
- Oil and gas resources may be extracted by conventional methods only; no in-situ or mining methods will be employed. Secondary recovery methods of liquid hydrocarbons may be employed only upon approval by the District Engineer, BLM with concurrence of the authorized officer.
- Oil and Gas Lease Stipulation for Non-Conventional Oil Recovery. Under the provisions of Public Law 97-78, this lease includes all deposits of nongaseous hydrocarbon substances other than coal, oil shale, or gilsonite (including all vein-type solid hydrocarbons). Development by methods not conventionally used for oil and gas extraction, such as fire flooding and including surface mining, will require the lessee to submit a plan of operations and will be subject to regulations governing development by such methods when rules are issued by the BLM, and the rules or procedures of the surface managing agency, if other than BLM. Development may proceed only if the plan of operations is approved.

CATEGORY 3

The potential for off-site exploitation of tar sand deposits is virtually nonexistent when compared to conventional oil and gas exploration and development.

SURFACE DISTURBANCE STIPULATIONS FOR COMBINED HYDROCARBON LEASES

1. Notwithstanding any provisions of this lease to the contrary, any mining, drilling, or other operation on the leased lands that will disturb the surface thereof or otherwise affect the environment, hereinafter called surface-disturbing operation, conducted by lessee shall be subject, as set forth in this stipulation, to prior approval of such operation by the authorized officer of BLM in consultation with the appropriate surface management agency and to such reasonable conditions, not inconsistent with the purposes for which this lease is issued, as the authorized officer may require to protect the surface of the leased lands and the environment.

2. Prior to entry upon the land or the disturbance of the surface thereof for mining, drilling, or other purposes, lessee shall submit for approval three (3) copies of a plan of operations which shall meet the requirements of Title 30 of the Code of Federal Regulations (30 CFR) Subparts 231.4 and 231.10 (a), (b), and (c) to the authorized officer and the appropriate surface management agency named above. The submitted plan of operations must contain, in addition to all requirements stated above, the methods and actions proposed for the following:

- Stripping and saving of topsoil.
- Reclamation of the disturbed areas, including, but not limited to recontouring and revegetation with native species or ecological equivalents.
- Erosion control measures on all disturbed areas, roads and waterway crossings.
- Road design, construction, and maintenance standards would be subject to BLM 9113 Roads Manual.
- Cultural resource protection and clearance and/or protection plan would be required prior to all surface-disturbing activities. All costs of inventory and data recovery would be borne by the lessee.
- Livestock protection such as fencing or otherwise excluding livestock from active mining areas.
- Fugitive dust and emissions control with fugitive dust abatement being required on all major haulage roads.
- Wildlife protection and mitigation would include threatened or endangered species. Clearance would have to be given by the appropriate agency prior to any surface disturbance, and all transmission lines would be raptor-proof.
- Protection of streams, springs, water wells, and other water sources would include, but would not be

limited to, stream and drainage crossings being protected by appropriate stipulations, including a U.S. Army Corps of Engineers 404 Permit.

- Methods of retaining all mine drainage and runoff on-site.
 - Environmental analysis will be made by the authorized officer in consultation with the appropriate surface management agency for the purpose of assuring proper protection of the surface, the natural resources, the environment, existing improvements, and for assuring timely reclamation of disturbed lands.
3. Upon completion of said environmental analysis, the authorized officer shall notify lessee of the conditions, if any, to which the proposed surface-disturbing operations will be subject. Said conditions may relate to any of the following:
- Location of mining, drilling, or other exploratory developmental operations or the manner in which they are to be conducted.
 - Types of vehicles that may be used and areas in which they may be used.
 - Manner or location in which improvements such as roads, buildings, pipelines, mills, processing plants, or other improvements are to be constructed.

Public Water Reserve 107 and Legal Water Source Stipulations

To protect important aquifers, all surface and in-situ mining must be preceded by complete hydrological testing and evaluation as specified by the authorized officer of BLM. Any loss of springs or reduction in perennial streamflow will be fully mitigated with an equal quantity and quality as specified by the authorized officer of BLM.

APPENDIX 2

SPECIFIC CRITERIA USED TO DERIVE LEVELS OF FAVORABILITY AND CERTAINTY FOR OIL AND GAS RESOURCES FOR CIRCLE CLIFFS STSA

GENERAL

Favorability--The organic remains typically contained in sedimentary rocks such as shale and limestone are considered by many investigators to be the chief source of the world's hydrocarbons. This organic debris is generally more abundant, accumulates more rapidly, and is much better preserved in near-shore marine environments where life is teeming, although some nonmarine environments may also contain significant accumulations of organic debris. Where such accumulations are heated during deeper burial, a series of poorly understood chemical and physical reactions transform part of the organic material into petroleum. Petroleum is an inclusive term applied to substances ranging from gaseous to solid; it includes crude oil and natural gas. Contained compaction during deep burial apparently expels the fluid and gaseous portions of the petroleum, which then migrate toward zones of lower pressure. If the transmissivity of the rocks is sufficient and favorable reservoir rocks and traps are available, oil and gas pools can accumulate. The degree of geologic favorability of an area for commercial oil and gas pools thus depends on the following regional or provincial characteristics: (1) thickness and volume of sedimentary rocks; (2) the presence of adequate source rock; (3) the level of maturation of the organic matter in the geologic environment; (4) the availability of both porous and permeable reservoir rock; (5) the development of reservoir traps coincident with petroleum migration; and (6) the severity of post-entrapment tectonic and geothermal activity. Many other factors can also influence the apparent favorability of a region but the factors listed above are essential.

The anticipated size (small, medium, and large) of oil and gas pools in each of the favorability categories listed below are modified from "Reserve Estimates of New Field Discoveries" (Committee on Statistics of Drilling, 1980).

The degree of certainty of oil and gas occurrence is based on the proximity of direct evidence that either supports or refutes the existence of the resource in the immediate environment of the area. Direct evidence includes the following: (1) surface oil and gas seeps caused by leakage from fractured reservoirs; (2) tar sand or oil-impregnated sandstone deposits (oil shales are non-maturated or only partly maturated source rocks and are treated as a separate resource); (3) results from exploration and development (includes wildcat, deeper and shallower, pool tests, outpost or extension tests, and development wells); and (4) analytical data such as composition and specific gravity that offer proof of fluid-hydrocarbon presence.

Geophysical data, chiefly seismic, are often mistakenly assumed to provide proof, or at least a high degree of certainty, that oil and gas resources actually occur in an area. However, geophysical data are no more than tools used to interpret the stratigraphy and structure of a region and as a means of determining its degree of "geologic favorability" for oil and gas. As such, geophysical data will be used as a measure of favorability--not certainty.

Data on well yield and on oil and gas quality are considered economic information and are used along with other data to estimate the contribution that oil and gas will make to the overall importance rating of the area. Such data include: flow or pumping rates for wells; specific-gravity determinations; chemical analyses for sulfur, nitrogen, and the amounts of various metal and mineral contaminants (in the case of crude oil); and hydrogen sulfide, nitrogen, carbon dioxide, and helium analyses (in the case of raw gas).

FAVORABILITY

F1: Lands designated as having the lowest favorability for oil within a geologic environment dominated by igneous and metamorphic rocks that constitute a regional basement at or near the surface, or by intense recent tectonic activity, particularly where characterized by pervasive fracturing or brecciation. In such areas, source rocks either do not exist or have been strongly altered, with concomitant loss of most of the contained volatiles and, in some cases, the alteration of remnant carbon to graphite. Similarly, traps or reservoir rocks either have not developed or have been altered or destroyed by intense igneous, metamorphic, and tectonic events. Consequently, in most of these present-day geologic environments, pre-existing concentrations of oil and gas would have been vaporized by the intense heat or lost to the hydrosphere or atmosphere upon a loss of confining pressure during fracturing and brecciation.

F2: The geologic environment of an area rated at the F2 level for oil and gas is considered to have a potential only for small, widely scattered oil and gas pools. The size of recoverable hydrocarbon accumulations in such an environment would be anticipated to be less than 10 million barrels of oil or, if gas, no more than 60 billion cubic foot (Volume grades D through F). The cumulative thickness of sedimentary rocks in the F2 geologic environment will generally be less than a few thousand feet thick. Such a relatively thin stratigraphic sequence generally limits the volume of both favorable source and reservoir rocks; hence the expected small size and low frequency of oil and gas pools. Moreover, any medium-size or larger accumulations that may have existed

in earlier favorable environments in the area have since been destroyed or reduced in size by recent tectonic events and/or fresh water flushing.

F3: Lands considered favorable for oil and gas at the F3 level are within an environment that may contain either densely spaced small pools or scattered, moderately large pools. Recoverable fluid hydrocarbons are anticipated to be between 10 and 50 million barrels of oil, or between 60 and 300 billion cubic feet of gas (Volume grade B and C). The geologic environment deemed likely to host such intermediate quantities of oil and gas would generally contain a sedimentary sequence less than 5,000 feet thick. This rock sequence must be heterogeneous in composition and contain at least one organically rich marine formation to provide a hydrocarbon source. Moreover, the geologic history of the area must be such that the presence of stratigraphic and structural traps can be reasonably inferred. Finally, evidence of possible fresh-water flushing of potential reservoir rocks must be minimal.

F4: Lands designated F4 must be within a geologic environment that is favorable for large accumulations of oil and gas. Recoverable fluid hydrocarbons in such an environment are anticipated to be more than 50 million barrels of oil, or if gas, more than 300 billion cubic feet (Volume grade A). The geologic environment must include a heterogeneous sequence of sedimentary rocks with a thickness generally well over 5,000 feet. Organically rich marine source rocks should be relatively abundant. Numerous reservoir rocks and stratigraphic and structural traps must be confidently inferred to exist in the area, based on its geologic history. Multiple oil and gas reservoirs stacked in vertical succession should be reasonably inferred to occur in this geologic environment. Recent tectonism must be at a minimum, if present at all. There should be no evidence of possible fresh-water flushing of potential reservoir rocks.

CERTAINTY

C1: In the lowest level of certainty for oil and gas, C1, no direct data are available to support or refute the occurrence of petroleum within the area, regardless of the level of geologic favorability. No wells have been drilled in or near the area, nor are any oil or gas seeps, tar sand, or oil-impregnated sandstone deposits known in the vicinity. Positive evidence of resource occurrence is far removed from the area or is on a trend considered unrelated to the geology

of the area. Accordingly, the area will not be with an "established" or generally accepted "potential" petroliferous province.

C2: A lower but intermediate level of certainty, C2, for oil and gas again implies that no direct data (seeps, exploratory wells, or producing wells) occur within or very near the area being evaluated. However, positive occurrence data must be available from the vicinity of the area; thus, the area will probably be within a petroliferous province (basin) with at least one producing or formerly commercial oil and/or gas field. Seeps, shows, or productive wells present at some distance along a known productive trend are considered as stronger evidence for certainty than closer-in occurrence known to be off-trend. Thus, oil and gas shows as much as several miles away on-trend are better indications of certainty than those less than 1 mile distant but off-trend. Positive-occurrence data on parallel similar-type trends, although at some distance, are considered evidence for at least a C2 certainty.

C3: The C3, or higher-intermediate, degree of certainty for oil and gas requires the recognition of at least one seep, a show in an exploratory well, or a producing well from within or very near the area being evaluated. Moreover, the area will likely be within an established petroleum-producing province. If several wells have been drilled in or near the area, at least one must have a strong show. A C3 rating can also be used if the rating-team consensus deems that the extrapolation of nearby positive-direct data is stronger than for a C2 certainty. (If a number of wells from within or near the area have been drilled and all were dry, a C3 or C4 certainty rating would be applied in conjunction with a low favorability rating.)

C4: The highest level of oil and gas certainty, C4, is used only when the area being evaluated lies within a well-known, productive petroliferous province. Abundant and direct evidence such as seeps, shows, or producing wells occur within or immediately adjacent to the area. (By definition, when a C4 certainty is used with a F1 favorability, the dual rating indicates with a high-degree of certainty that commercial quantities of oil and gas do not occur in or near the area.)

The source for this report is Science Application, Inc. (1982). Additional reference information is included in the Bibliography of this volume.

LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Term</u>
ACEC:	Area of Critical Environmental Concern
APD:	Application for Permit to Drill
API:	American Petroleum Institute
AUM:	animal unit month
bbl:	barrels
BLM:	Bureau of Land Management
CCD:	Census County Division
CFR:	Code of Federal Regulations
CHL:	combined hydrocarbon lease
CMA:	Cooperative Management Area
DOE:	Department of Energy
EA:	environmental assessment
EIS:	environmental impact statement
EPA:	Environmental Protection Agency
ERT:	Environmental Research and Technology, Inc.
F:	Fahrenheit
FIRE:	Finance, Insurance, and Real Estate
FLPMA:	Federal Land Policy and Management Act
FR:	Federal Register
FS:	Forest Service
FWS:	Fish and Wildlife Service
g/cc:	grams per cubic centimeter
H ₁ :	hydrogen
HMP:	Habitat Management Plan
HUD:	Department of Housing and Urban Development
IBLA:	Interior Board of Land Appeals
IMP:	Interim Management Policy
IPP:	Intermountain Power Project
ISA:	Instant Study Area
KGS:	known geologic structure
KRCRA:	known recoverable coal resource area
lbs.:	pounds
MFP:	Management Framework Plan
MMS:	Minerals Management Service
NO:	nitrogen oxide
NO ₂ :	nitrogen dioxide
NPS:	National Park Service

<u>Abbreviation</u>	<u>Term</u>
NRA:	National Recreation Area
NWPS:	National Wilderness Preservation System
OSPC:	Office of the State Planning Coordinator
ORV:	off-road vehicle
PCPI:	per capita personal income
PSD:	Prevention of Significant Deterioration
PRLA:	Preference Right Lease Application
R&PP:	Recreation and Public Purposes
RMA:	Recreation Management Area
RMP:	Resource Management Plan
ROS:	Recreation Opportunity Spectrum
RVD:	Recreation Visitor Day
S:	sulfur
Sec:	section
SLM:	Salt Lake Meridian
SMSA:	standard metropolitan statistical area
SO ₂ :	sulfur dioxide
SSA:	site-specific analysis
SSF:	soil surface factor
STSA:	special tar sand area
SVIM:	soil-vegetation inventory method
TDS:	total dissolved solids
TSP:	total suspended particulates
UDES:	Utah Department of Employment Security
UDOT:	Utah Department of Transportation
UDWR:	Utah Division of Wildlife Resources
UGMS:	Utah Geological and Mineralogical Survey
mg/m ³ :	milligrams per cubic meter
U ₃ O ₈ :	uranium oxide
USDA:	United States Department of Agriculture
USDC:	United States Department of Commerce
USDI:	United States Department of Interior
USGS:	United States Geological Survey
V ₂ O ₅ :	vanadium oxide
VRM:	visual resource management
WA:	Wilderness Area
WSA:	Wilderness Study Area

GLOSSARY

- A-WEIGHTED SOUND LEVEL (dBA).** The measurement of sound approximating the auditory sensitivity of the human ear.
- ACCIPITERS.** A genus of small- or medium-sized hawks having short, rounded wings and long tails.
- AIR QUALITY.** All lands are categorized in one of the Prevention of Significant Deterioration (PSD) Classes. Class I is the most restrictive and generally applies to specific national parks and monuments. No decrease in air quality is allowed under this class. Class II areas allow some decrease in air quality. Class III areas allow for a substantial decrease in air quality such as is found in urban areas.
- ALLOTMENT (RANGEALLOTMENT).** A management area designated for the use of a prescribed number and kind of livestock under one management plan. An area where one or more livestock permittees graze their livestock, consisting of public lands and any enclosed State and private lands.
- ALLUVIAL FANS.** Unconsolidated sedimentary material deposited by streams in fan- or cone-shaped deposits at the base of mountains.
- ALTERNATIVE.** One of at least two proposed means of accomplishing planning objectives.
- ANALYSIS.** The examination of existing and/or recommended management needs and their relationships to discover and determine the outputs, benefits, effects, and consequences of initiating a proposed action.
- ANIMAL UNIT MONTH (AUM).** The amount of forage required to sustain the equivalent of 1 cow or 6.2 sheep for 1 month; 5.8 deer for 1 month; 9.6 antelope for 1 month; 5.5 bighorn sheep for 1 month; or 2.2 burros for one month (usually 800 lbs. of useable air-dried forage).
- ANTICLINE.** An upfold or arch of stratified rock in which the beds or layers bend downward in opposite directions from the crest or axis of the fold.
- AQUATIC.** Living or growing in or on the water.
- AQUIFER.** A geologic formation or structure that transmits water. Aquifers are usually saturated sands, gravel, fractured rock, or cavernous rock.
- ARCHAEOLOGY.** The scientific study of past cultures.
- AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC).** An area of public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values; fish and wildlife resources; or other natural systems or processes, or to protect life/provide safety from natural hazards.
- BITUMEN.** A naturally occurring viscous mixture of hydrocarbons that may contain sulphur compounds and that, in its' naturally occurring state, is not recoverable at a commercial rate through a well.
- CARRYING CAPACITY.** The maximum stocking rate of livestock and/or big game possible without damaging vegetation or related resources. It may vary from year to year on some areas because of fluctuating forage production.
- CATEGORIES (LEASING).** The four categories used to determine leasing activities for oil and gas and tar sand were based on potential for development, other resource uses, and protection of sensitive resource values. *Category 1* opens all public lands to leasing with standard stipulations (see Appendix 1). *Category 2* allows leasing with standard and special stipulations to protect sensitive resource values. *Category 3* allows leasing with no right of surface occupancy: recovery methods must not disturb the surface; and *Category 4* closes lands to leasing.
- CENSUS COUNTY DIVISION (CCD).** A division designated to represent community areas focused on trading centers or to represent major land use areas. (CCDs have visible, permanent, and easily described boundaries.)
- CHANGE AGENT.** Any factor (person, physical force, living entity, chemical, etc.) which affects the primary characteristics of an ecological element, either positively or negatively.
- COMBINED HYDROCARBON LEASE (CHL).** A lease issued in a Special Tar Sand Area (STSA) which entitles the lessee to remove any gas and nongaseous hydrocarbon substance other than coal, oil shale, or gilsonite.
- CONVERSION.** The process of converting bitumen into synthetic crude oil; upgrading.
- CRUCIAL WILDLIFE HABITAT.** That portion of wildlife habitat essential to the survival and perpetuation of a certain species in an area.
- CRUDE OIL.** Oil as it comes from a well.
- CULTURAL RESOURCES.** Those resources of historical or archaeological significance.
- DEPOSIT.** An accumulation of oil capable of being produced commercially.
- DIRECTIONAL DRILLING.** Slant drilling or drilling on an angle. Directional drilling is utilized when the operator is not allowed to occupy the surface of a given tract of land, but still wishes to drill a structure or target beneath that tract.
- EDGE EFFECT.** The effect that occurs when two or more habitat types come together and create more favorable wildlife habitat than either type could provide alone.
- ERODIBILITY.** Susceptibility of a soil to erosion by water or wind. Relative terms are none, slight, moderate, and high.
- ENDANGERED SPECIES.** Any animal or plant species in danger of extinction throughout all or a significant portion of its range.
- ENVIRONMENTAL ANALYSIS.** A systematic process for consideration of environmental factors in land management actions.
- EXPLORATION PERMIT.** A prospecting permit; a short-term agreement granting the holder the right to explore for minerals, oil and gas, or tar sand.
- EXPRESSIONS OF LEASING INTEREST.** As used in this EIS, industry nominations to lease tracts within Special Tar Sand Areas (STSAs) which are not currently under lease.
- EXTRACTION.** As used in this EIS, the process by which bitumen is separated from sand, water, and other impurities.
- FLOODPLAIN.** Nearly level land bordering a stream; this land consists of stream sediments and is subject to flooding.
- FORAGE.** Vegetation of all forms available and of a type used for animal consumption.
- FORB.** A broad-leaved herb.
- HABITAT.** A specific set of physical conditions that surrounds a single species, a group of species, or a large community. In wildlife management, the major components of habitat are food, water, cover, and living space.
- HERD UNIT.** An area designated by the Utah Division of Wildlife Resources (UDWR) as a big game (i.e., deer, elk, moose, etc.) herd management area.
- HYDROCARBONS.** Organic chemical compounds of hydrogen and carbon atoms which form the basis of all petroleum products.
- HYDROPHILIC.** Having an affinity for water.
- INFRASTRUCTURE.** The set of supporting systems and facilities (i.e., transportation, education, medical service, communication, fire, and police protection, etc.) that support a region's or community's social and economic structures.
- IN PLACE.** As used in this EIS, the gross volume of crude bitumen or oil calculated or interpreted to exist in a reservoir before any volume has been produced.

GLOSSARY

IN SITU. In place.

IN-SITU EXTRACTION. As used in this EIS, extracting the oil from tar sand while it is still in place by injecting steam, solvents, and/or heat.

INSTANT STUDY AREA (ISA). All public lands which were formally designated as natural or primitive areas before November 1, 1975. These areas are being considered for designation as Wilderness Areas and, if designated, will be included in the National Wilderness Preservation System (NWPS).

INTERIM MANAGEMENT POLICY (IMP). An interim measure governing uses on lands under wilderness review. This policy protects Wilderness Study Areas (WSAs) from impairment of their suitability as wilderness.

INTERMITTENT STREAM. A stream which flows part of the time, usually after a rainstorm or during a spring thaw.

KNOWN GEOLOGIC STRUCTURE (KGS). A geologic structure known to be present because of examination of exposures or well records.

LAND USE PLAN. A planning decision document which establishes resource allocations and coordinated objectives and constraints for all forms of public land and resource uses within a specified area.

LEASE (MINERAL). A contract between a landowner and another granting the latter the right to search for and produce gas, hydrocarbons, or other mineral substances upon payment of an agreed-upon rental, bonus, and/or royalty.

LEASE CONVERSION. As used in this EIS, the process of converting an existing oil and gas lease in a Special Tar Sand Area (STSA) to a Combined Hydrocarbon Lease (CHL). The conversion is completed through approval of a plan of operation outlining how the hydrocarbon resource will be developed.

LEASING CATEGORIES. Refer to categories (leasing).

LINEAR SOURCE. A line or trajectory at which material or other matter is added to a system either instantaneously or continuously. An example of a linear source in the context of air pollution would be highway traffic.

LIQUID HYDROCARBONS. Oil substances other than gas and solid substances (i.e., coal, oil shale, and gilsonite) which occur naturally in the earth.

MANAGEMENT FRAMEWORK PLAN (MFP). A land use plan for public lands administered by BLM which provides a set of goals, objectives, and constraints for a specific planning unit or area; a guide to the development of detailed plans for the management of each resource.

MIGRATION ROUTES. Historical wildlife routes used to travel from one type of seasonal range to another.

MILLIDARCY. A unit of porous permeability equal to 1/1000 darcy. Having to do with flow of fluids under pressure. A darcy is a unit of measure where the rate of flow of a fluid having one centipoise viscosity under pressure gradient of one atmosphere per centimeter would be 1 cubic centimeter per second per square centimeter cross section.

MITIGATION MEASURES. Measures developed to lessen impacts to resources resulting from proposed projects.

MONOCLINE. A geologic structure in which the strata are all inclined in the same direction at a uniform angle of dip.

MULTIPLE USE. Management of public lands and their various resource values so that they are used in the combination best meeting the present and future needs of the American people. Relative resource values are considered, not necessarily the combination of uses that will give the greatest potential economic return or the greatest unit output.

NATIONAL WILDERNESS PRESERVATION SYSTEM (NWPS). A system composed of Federally owned areas designated by Congress as Wilderness Areas. These areas shall be administered for the use and enjoyment of the American people; management actions will preserve wilderness values for future use and enjoyment.

NONIMPAIRMENT CRITERIA. A series of guidelines which govern surface-disturbing activities on lands currently being studied by BLM for inclusion in the National Wilderness Preservation System (NWPS). The guidelines require that reclamation of disturbed areas be substantially unnoticeable when the Secretary of Interior makes his recommendation on Wilderness Areas to the President.

NOTICE OF INTENT. A notice submitted to BLM by an existing oil and gas lessee in a Special Tar Sand Area (STSA). This notice states that the lessee intends to submit a plan of operation to convert his existing lease to a Combined Hydrocarbon Lease (CHL).

NO ACTION ALTERNATIVE. An alternative which would continue the current management direction or level of management intensity.

OFF-ROAD VEHICLE (ORV). Any motorized vehicle designed for or capable of cross-country travel over land, water, sand, snow, ice, marsh, swampland, or other terrain.

OUTCROPS (TAR SAND). Those parts of a tar sand deposit exposed on the surface.

OVERBURDEN. Material of any nature, consolidated or unconsolidated, that overlies a deposit of useful materials, ores, or coal, especially those deposits mined from the surface by open cuts.

PATENTED MINING CLAIM. A parcel of mineral land for which the Federal Government has conveyed title to an individual.

PERCHED WATER TABLE. An aquifer formed by beds of clay or silt, unfractured consolidated rock, or other material with a relatively lower permeability than the surrounding materials, present in some areas above the regional water table. It is of limited areal extent with an unsaturated zone between bottom of the perching bed and the regional water table.

PERENNIAL STREAM. A stream with a yearlong flow.

PERMEABILITY (SOIL). The ease with which gasses, liquids, or plant roots penetrate or pass through a layer of soil.

PETROGLYPH. Prehistoric rock art pecked or carved into rock.

PICTOGRAPH. Prehistoric rock art drawn or painted onto rock.

PILOT PLANT. A small model plant for testing processes under actual production conditions.

PLAN OF OPERATION. As used in this EIS, a plan submitted by a lessee which outlines in detail exploration and mining proposals.

PLANNING AREA. One or more planning units for which Management Framework Plans (MFPs) or Resource Management Plans (RMPs) are revised/prepared.

PLANNING UNIT. A geographic unit within a BLM district which includes related lands, resources, and use pressure problems; these items are all considered for resource inventory and planning.

POINT SOURCE. A point at which matter is added to a system either instantaneously or continuously. An example of a point source in the context of air pollution would be a smokestack.

PREFERRED ALTERNATIVE. The alternative selected by the surface management agency as the alternative resulting in the least environmental consequences while allowing development of a specified resource (i.e., development of tar sand).

PRIMITIVE RECREATION. A roadless area at least 3 miles from existing roads (or geographically isolated) and at least 5,000 acres in size, which is largely unmodified and removed from the evidences of man. Off-site management and facilities within the primitive area are employed to administer recreation use; encounters between parties within these areas are less than six per day.

PRIMITIVE RECREATION VALUES. Environmental features that enhance the quality of unconfined, undeveloped, and unmotorized recreation (i.e., hiking, backpacking, cross-country skiing, etc.). A general description would be scenic, undeveloped lands essentially removed from the effects of civilization with opportunities for solitude.

PRIOR STABLE LEVEL. This number is derived from consideration of deer population dynamics data averaging 10 or more years when deer populations were stable. This level is at the range's carrying capacity for a given deer herd unit.

PUBLIC LANDS. Any lands or interest in lands outside of Alaska owned by the United States and administered by the Secretary of Interior through the BLM, except lands located on the Outer Continental Shelf and lands held for the benefit of Indians.

PUBLIC PARTICIPATION. The process of attaining citizen input into each stage of the planning process. It is required as a major input into BLM's planning system.

GLOSSARY

- RAPTORS.** Birds of prey such as eagles, hawks, and owls.
- RECLAMATION.** The process of converting mined land to its former or other productive uses.
- RESOURCE.** A product of the earth or biosphere capable of serving, supplying, or supporting some human purpose or need.
- RESOURCE AREA.** A manageable geographic subdivision of a BLM district consisting of one or more planning units or areas.
- RESOURCE MANAGEMENT PLAN (RMP).** A written land use plan that outlines BLM's decisions and strategy for management of the resources in a particular area. The RMP is replacing Management Framework Plans (MFPs) in BLM's planning system.
- RIPARIAN HABITAT.** A native environment which supports plants adapted to moist growing conditions. Such habitat is found along waterways, ponds, and other wet areas.
- RURAL LIFESTYLE VALUES.** Those lifestyle values of significant worth as perceived by residents or local communities in a rural social environment.
- SAGE GROUSE STRUTTING GROUNDS.** A communal courtship display ground where both sexes of sage grouse congregate during the breeding season to mate.
- SATURATION.** As used in this EIS, a measure of the extent to which pore space in the sand or rock is occupied by bitumen or oil. Also, the extent to which pore space in soil is occupied by water.
- SCOPING PROCESS.** A process whereby public issues and concerns for a proposed project are identified.
- SEDIMENT YIELD.** The amount of mineral or organic soil material in suspension, being transported, or being moved from its site of origin.
- SEMI-PRIMITIVE MOTORIZED RECREATION.** A roaded area (primitive and secondary county maintained) of at least 2,500 acres, which is largely natural with surface disturbances limited. Only small, isolated structures and evidences of man are present, and encounters between users are moderate. Off-site administration of users is encouraged with small on-site controls evident.
- SENSITIVE SPECIES.** Species not yet officially listed but undergoing status review for listing on the official Fish and Wildlife Service (FWS) Threatened and Endangered list; species whose populations are small and widely dispersed or restricted to a few localities; and species whose numbers are declining so rapidly that official listing may be necessary.
- SERIAL COMMUNITIES.** Communities depicting various stages of plant development.
- SHRUB.** A plant that has a persistent woody stem, a relatively low growth habit, and generally produces several basal shoots instead of a single trunk.
- SPECIAL TAR SAND AREA (STSA).** An area known to contain substantial deposits of tar sand. Eleven STSAs were established in eastern Utah by the Combined Hydrocarbon Leasing Act of 1981. The Act provided for the conversion of existing oil and gas leases in STSAs to Combined Hydrocarbon Leases (CHLs). This Act also requires competitive leasing for currently unleased lands within STSAs.
- SOIL-VEGETATION INVENTORY METHOD (SVIM).** A uniform, systematic method for inventory of soil and vegetation resources and data collection for use in planning and environmental assessments.
- STAGING GROUND.** A gathering and starting point for a recreational activity.
- STATE LANDS.** Lands owned by the State of Utah: school lands, sovereign lands, and lands acquired for special purposes.
- TAR SAND.** Sand and other rock material containing crude bitumen.
- TAR SAND DEPOSIT.** A natural bitumen (oil-impregnated) containing or appearing to contain an accumulation of tar sand, separated or appearing to be separated from any other such accumulation. Tar sand constitutes one of the largest known nonfluid petroleum resources in the United States. Approximately 90 percent of America's tar sand (27 billion barrels) is located in Utah.
- THREATENED SPECIES.** Any plant or animal species likely to become endangered within the foreseeable future throughout all or a part of its range.
- UNIT RESOURCE ANALYSIS (URA).** A compilation of physical resource data and an analysis of the current use, production, condition, and trend of resources; the URA also contains a profile of ecological values and describes potentials and opportunities for development of resources within a planning unit or area.
- VISUAL ELEMENTS (BASIC).** The elements which determine how the character of a landscape is perceived. *Form:* the shape of objects such as landforms or patterns in the landscape. *Line:* Perceivable linear changes in contrast resulting from abrupt differences in form, color, and texture. *Color:* The reflected light of different wave lengths that enables the eye to differentiate otherwise identical objects. *Texture:* The visual result of variation in the surface of an object.
- VISUAL RESOURCE MANAGEMENT (VRM) SYSTEM.** Classification containing specific objectives for maintaining or enhancing visual resources, including the kinds of structures and modifications acceptable to meet established visual goals.
- WATERFOWL.** Wildlife species such as ducks, geese, and swans.
- WATERSHED.** The total area above a given point on a stream that contributes water to the flow at that point.
- WETLANDS.** Lands including swamps, marshes, bogs, and similar areas such as wet meadows, river overflows, mud flats, and natural ponds.
- WILDERNESS.** An area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements.
- WILDERNESS AREA.** An area officially designated as wilderness by Congress. Wilderness Areas will be managed to preserve wilderness characteristics and shall be devoted to the public purposes of conservation and recreational, scenic, scientific, educational, and historical uses.
- WILDERNESS MANAGEMENT POLICY.** The BLM policy which governs administration of public lands designated as Wilderness Areas by Congress. It is based on the mandate of Congress as contained in the Wilderness Act of 1964 and the Federal Land Policy and Management Act (FLPMA) of 1976. FLPMA requires a Wilderness Area to be a roadless area or island that has been inventoried and found to have wilderness characteristics as described in Section 603 of FLPMA and Section 2 (c) of the Wilderness Act.
- WILDERNESS STUDY AREA (WSA).** An area under study for possible inclusion as a Wilderness Area in the National Wilderness Preservation System (NWPS).
- ZERO DISCHARGE.** The lack of any effluent from a given point or source.

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